SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

No. 1695.—Vol. XXXVIII. LONDON, SATURDAY, FEBRUARY 15, 1868. {STAMPED .. SIXPENCE. UNSTAMPED. FIVEPENCE.

Royal School of Mines, Jermyn-Street.

Mr. WARINGTON SMYTH'S LECTURES.

[FROM NOTES BY OUR REPORTER.]

Lecture XXVII.—Continuing his remarks upon timbering, Mr Smyth said that it was one of the subjects of primary and vital importance in mining, as the lives of thousands of human beings every day depended upon it; and it was a lamentable fact that hundreds of those lives were lost every year by reason of insufficient timbering, or want of knowledge and judgment in its application. This came to pass in different ways. Thus, in the larger seams of coal, where as much as possible had to be removed, there was a temptation to leave too great an extent of roof unsupported, and hence a fall, which sometimes was so unexpected as to cause the deaths of the men working beneath. Coal would sometimes make an exceedingly good roof for a large area, but the moment this overhead material came to a joint a very large expanse of what had previously been safe would come down. There were always planes of division, both horizontal and vertical, in coal, which, if well ascertained and understood, helped the miners greatly; but, at the same time, those divisions were the sources of great danger, when too much trust was placed in the natural strength of the roof. It was, therefore, necessary, even in the best of cases, not to be too chary of putting in props. Very often a single prop would suffice, but if the material of either roof or sole were in any degree of a friable character there should be head and foot plates at the extremities of the props. These were called "stemples," or "stuhl pieces." Miners were only to apt to go on in fancied security until they worked far beyond the limits of anything like safety, and it had, therefore, been found necessary to have a proper officer to watch the workings, and to put in props whenever they were required. In some mines a great number of lives were lost from the fossil *sigillaria* embedded in the coal, which in ante-diluvian ages had been trunks of trees. These were often met with in an upright position, or at right angles to the plane of the coal seams, varying from 1 foot in diameter to much larger dimensions, weighing from 3 or 4 cwts. to 1 ton. They were covered in their circumference with a thin crust of slimy clay, and thus when the support was cut away from below at their thicker extremity they were liable to drop out without warning upon those below, and many men owed their deaths to circumstances of that kind. Whenever, therefore, the appearance of a ring of this sort was observed a prop should be at once put in, without reference to any other consideration. He recollected being in a colliery in Wales, a little while ago, where he could not go 6 or 8 feet without coming to one or more of these "bell-moulds," as they were called. They could not, therefore, be too careful about examining the roof from time to time. When the props employed were numerous the cost became so serious that it was found advisable as the valuable mineral was cleared out to withdraw them, allowing the roof to fall in behind. In these cases the back rows of props ought to be taken out by a separate set of men, and not by the hewers. It was a task of great risk, and required much skill and judgment, as well as coolness and courage. Cast-iron had been tried for single props, but its employment had not made much way. They had the advantage, however, of being made in sections, so that they were easily removed when they had to be taken from the back to the front of a working. Single props were much used in metalliferous mines, but it frequently happened that much more was required than a simple cross stemple. He once had the good fortune to be present at the opening of an old tin mine, into which he crept, and there saw a very curious specimen of timbering, which, although probably hundreds of years old, the mine having been full of water, was still in good preservation. Although too complicated to be altogether unobjectionable, it was very ingenious, and contained the application of the principles now recognised in works. The lecturer then drew diagrams on the board of this ancient timbering, as affording good illustrations of expedients which under peculiar circumstances might be resorted to. These circumstances, although extremely various, depended upon the individual condition in each case of the hanging or foot wall, and either one side or both was apt to break away. Thus stull-pieces might be required on either one or both sides of the level, and their strength must depend upon the amount of pressure to be met.

He now came to the subject of timbering the actual drifts in levels themselves. If no sufficient support could be had from the sides to prop the material overhead, a variety of expedients would be found necessary. Of them the simplest was called "door-post" timbering, or a complete framework, known in the West of England as a "durnz." Where the depth did not extend to any great distance it was often sufficient to work with plank timbering, put quite close together. This was generally the case in military mining, and of late in London in the new sewage works, which afforded very instructive examples of this kind of arrangement. The planks were supported by angular pieces, or struts, at each corner of the frame. In door-post timbering the leg pieces were put in sloping away at the bottom, and the mining engineer must, by means of a free use of the plumb-bob, take care that they are placed symmetrically. If the pressure were great from the top, then particular care must be taken as to the strength of the joints of the timbering (modes of effecting which were drawn on the board). In coal and iron mines in the North of England round timber was usually employed; and then care must be taken that the cutting to receive the cap be large enough, so as not to allow the latter to split the uprights. Some very excellent methods of performing this work were employed in Cornwall. In the Somersetshire collieries a very useful adjunct in equating the pressure of the roof was to put in over the caps what is called "rice," but which is simply brushwood. The problems resulting from vertical pressure were, however, comparatively easy when compared with those which resulted from the lateral or transverse pressure. Mr. Smyth then described cases in which the workings were of large size, and the timbers required to be of unusual strength. Sometimes massive cap-pieces, 10 to 14 inches square, were employed, and at others recourse was had to combined strengths of timber. A very notable piece of work of this kind had been carried out in the Botallack Mine, which all persons inteuding to become mining engineers ought to see. There was also a remarkable timbering at the Devon Great Consols Mines. Near the Anna Maria shaft there was a sill-piece of red pine 36 ft. long and 22 in. square, upon which was placed a triangular structure of timbers, from 18 to 28 ft. in length and 20 in. square. There was also a singular example at the St. John del Rey Mines, in Brazil, where stull-pieces were put in of extraordinary thickness, arresting a movement of the ground, which at first seemed impossible to be resisted. Rocks exposed to the action of the atmosphere were liable to oxidation, which caused their pieces to be detached from them, so that if a level were left for a considerable time it would be found very much smaller than when it was first opened. In such places the lasting power of timbers rapidly diminished, and they were soon broken and burst in. Indeed, works had been known to be so closed up as to present to the subsequent explorer the appearance of unopened ground. For the purpose of dealing with these great pressures elliptical frames had to be adopted, of solid timber, put together in pieces 6 ft. in length. Another method had sometimes been adopted—that of cutting the timber into short blocks, 2 ft. in length, and building them together, as it were, like stones. This was costly, but was found to have a great amount of strength. It was nothing else, in fact, than an application of the method of securing shafts called "tubbing," and the whole level lined with them looked like an elliptical shaft placed horizontally. The cost of this contrivance was very great, and that, therefore, prevented its use, except in extreme cases, but undoubtedly it was an important thing to recollect that timber laid in that way withstood pressure better than stone, and did not require any strong base for it to rest upon.

Lecture XXVIII.—It was, however, frequently the case that the dangerous and shifting character of the ground rendered advance impossible, unless it were won inch by inch and foot by foot—a work of great difficulty, and, therefore, requiring the greatest consideration and study from those who had to direct operations of this kind. The system followed in such cases is generally spoken of under the term of "spilling." There were many circumstances in mining where this mode of working became absolutely necessary; but they were exceedingly various. It frequently happened that there would be parts of the workings in which the ventilation was in an unsatisfactory state, and the timber in such places was exposed to the action of dry rot, when it would give way—sometimes very suddenly, and at other times so gradually as to allow new timbers to be put in before any accident was likely to occur. But if two or three caps in succession were broken away it might be necessary to have boards driven over the cap pieces, in which case great care must be taken not to leave spaces over them. If it were shaly ground, liable to fall away and come down suddenly with a weight of many tons upon the timbers, such unfilled spaces would be productive of evil consequences. All the spaces over the timber should, therefore, be filled in as closely as possible, so that when the pressure came it might have an equal incidence upon all parts of the timbering. When these breakages did take place they taxed the energy and ingenuity of most skilful miners to get through them, because it almost invariably happened that when one mass was removed it brought down more, and increased the insecurity. The use of "spilling-boards" or "laths," was in such cases a necessity. The operation of driving the "spilling-boards" in, was a most delicate undertaking when the ground consisted of decomposed granite, with much water in it or quick-sands, and unusual care was needed. In driving levels, it frequently happened that the workmen would open into a piece of ground which came down with a run, and if there were a considerable quantity of water in it, too much caution was impossible, as the sets of timber must fit very closely, and fresh sets must be put in until the difficulty was conquered. This often occurred when they had to pass through the bed of an ancient river or ravine, and some remarkable deposits of this kind had appeared in the Durham coal field. They also occurred frequently in Belgium and in the North of France, where those soft materials went down to a considerable depth, and had to be crossed by some of the workings. In the china-clay district the workmen had great difficulty in keeping the levels horizontal and regular, although when close timbered it was difficult to detect the reason of the deflection, and if "the level was lost," as the miners said, it was hard to recover. Indeed, it was often better and cheaper to try a fresh start and to give up the old level. In very wet ground it was the practice to make use of laths 5 or 6 ft. in length, shaped in a sort of trapezoidal manner, and a sufficient number being cut to suit the place, they were driven with large mallets into the ground, which was thus forced back as it were, and a passage was sought to be made without having to remove too much of the material.

In metalliferous mines, this kind of work against very wet ground was rarely adopted, on account of the difficulty attending its use, except in the case of quick-sands. The upper laths should be driven, not straight, but upwards, with a deviation of from 15° to 20° from the horizontal direction. The side laths should be driven at a somewhat less deviation, and the outward pressure would soon bring them parallel with the axis of the level. In the coal fields of Northern France and Belgium attempts had been made to drive levels through quick-sands, but these attempts had been entire failures, in consequence of the material being in deposits of such large extent, and so saturated with water. In the commune of St. Vaast, a level for a colliery in a piece of ground of this nature was commenced in 1747, and in 1843 it had only advanced 1150 metres. Of course, it had not been worked at the whole of that time, but every now and then the attempts had been renewed, until, in 1844, M. Durieux, an eminent engineer, devised a plan which proved successful. Instead of attempting to remove the sand he pushed through it, and thereby prevented those ruinous runs which had followed all the preceding excavations. It was effected by driving the face and sole full of oak pickets, boxing in the sides of the level with driving laths. As much advance was made in this instance in a few months as it had taken years to effect previously. Difficulties of this sort were got over in making railway tunnels, by dealing wirh only a small portion of ground at once. One of the most remarkable cases of this kind in the world was that of the Thames Tunnel. The elder Brunel, the engineer, who undertook the work, met with almost insurmountable difficulties, and in spite of all his precautions the work was repeatedly swamped. The greatest difficulty arose from their attempt to carry the tunnel at its whole height and width at once, the dimensions being no less than 38 ft. wide by 22 ft. high, so as to have two roadways. This would have been comparatively easy in many kinds of rock, but he had to deal with soft sand, gravel, marl, and clay. He succeeded, however, by constantly breasting up the front of the excavation by a strong shield of iron, divided into three stages, and also by vertical ribs, by which each stage was subdivided into 11 small cells. The men worked at each of these cells separately and simultaneously, and having advanced them 4 or 6 in. at a time, closing up their ground bib by bit, and the walls and roof secured by masonry, the shield was then pushed on by means of screws, and the whole structure was advanced in this way inch by inch. The system of opening only a small space at once was the best that could be devised, for in all tunnelling it was found that there were dangers which could only be safely encountered by that method. It fell to the lot of miners frequently to have to open out larger spaces than usual, and the great secret of safety and success in heavy ground was to open out only a small portion at once. It was customary in such cases to drive a small shaft ahead through the ground, timbering it for safety; another drift was then driven at the top with great caution if the ground were movable, and then other portions opened, and at length united. When the nature of the ground rendered it impossible to open a large piece at once, the men work small spaces, with strong timbering around them, and so push forward. A careful attention to the details of these precautions was the only way to prevent accidents where the ground was in a crumbling condition, or rendered dangerous by the presence of a large quantity of water.

Lecture XXIX.—Although the expense of lining shafts with masonry was very great, that was an expedient which sometimes had to be resorted to. In certain positions, and under peculiar circumstances, timber was subject to dry-rot; and there were instances in which levels had to be timbered twice over in four or five months. It was easy to conceive, therefore, when the excavations were of considerable magnitude, the cost of timbering became a serious charge, and often prevented a mine from attaining a profitable result. Frequently this rapid process of rotting was found to result from unsatisfactory ventilation. Timber, if kept cool, and at the same time moist, would last a long time: cases were known in which it had remained sound for centuries; but bad ventilation changed those conditions, and the air became hot and dry, and the timber would go rapidly. Supposing they had a level in which the air was circulating freely through it, with at one point a winze covered with a trap-door, it would be found that while the timber would stand well in the level in the good atmosphere, when the trap-door was lifted the winze would be full of hot, confined air, the wood covered with fungi, and the process of rotting going on, not only upon wood, but even the iron. Thus, in going over a mine, the visitor ought to be excessively cautious whenever he made a sudden plunge, as it were, into hot and confined air, as in such cases the staves of ladders, whether of wood or iron, were apt to be rotten to the core, and, of course, would, if trusted to, occasion, it might be, a serious accident. It was impossible to give any general rule to meet isolated cases of this kind. The various passages and entrances to a mine were so elaborate and complicated that examples of every kind were to be found; and there were also a great variety of means used for the preservation of timber, some of which were not very consistent with that rigid economy which the mining manager ought always to observe. Thus in salt mines it had been observed that the timber lasted longer than usual, and in consequence it had been proposed to soak timber in a strong brine. Again, it was the practice in many mines instead of removing timber found in a state of decay to replace only a sufficient proportion to secure the opening, leaving the rest to complete the process of rottenness, and to fall in the end when they could stand no longer; but it had been found that the removal of decaying matter was of great importance, for rot was, in fact, contagious, and spread with rapidity. In some shafts water was allowed to flow down when the lining was of wood, so as to keep it perpetually moist. Again, another method mentioned as successful was that of soaking the timber in pools of the water pumped up out of the mine into which the timber was going, and, no doubt, when such waters were impregnated with some of the sulphates they might aid in the preservation of the timber.

Next to the shaft of a mine the maintenance of its principal thoroughfares was of the most importance. If anything happened to them the mine might be shut up altogether. They ought to be rendered as perfect and as secure as possible, and it was in them that masonry or brickwork was generally employed. First of all, it was desirable to know where the material was to be found for this "stilling" or "steining," as it was called. It might be done with a great number of materials, and in some districts they had the advantage of obtaining them in close proximity to the mouth of the mine, and sometimes in the workings themselves. When this occurred it ought to be abundantly used, and walling invariably employed instead of timbering. In other cases it might cost so much more than wood that it became a question of balancing the extra cost against the advantages to be gained, and the purposes for which the levels were required. Thus, for exploratory levels it might be a question whether masonry should be put in, because they might turn out to have only a temporary existence; but in adit levels intended to unwater large districts, or in attacking large fields of minerals which might be expected to take 30 or 40 years in working out, it was best to establish the principal openings as permanently as possible. As to the material to be employed, the natural rock within the mine was the first thing to be looked to. If it were of a slaty, slabby character, easy to cut, full of iron pyrites, and liable to decomposition, its use must be avoided, and there were many argillaceous rocks containing a small portion of free silica which, although looking hard, were apt to crumble away in small pieces, and that, too, was a kind of material which should be avoided. The common bedded sandstone, freestone, or gritstone, such as those which were interstratified with the coal measures in South Wales and the Forest of Dean, were very useful, and might be cut and fashioned to a sufficient degree of nicety for underground work at a low rate of cost. Again, he had seen the carboniferous limestones in Flintshire and Derbyshire do good service, but, as a rule, they did not split with ease, and were often less contiguous to the mine than the other kinds he had mentioned. In most metalliferous workings clay-slate was the prevailing rock, and these, with the grauwacke common in North Devon, mica, hornblendic schists, and gneiss, were frequently used. Some kinds of granite also and porphyries were used in Cornwall, some excellent arching of that sort being carried out with great excellence in the Tresavean Mine. Lastly, he might mention that in many districts where they had none of these materials conveniently present, and especially in certain coal fields where there was no freestone, Nature had provided an excellent substitute in the shape of the clays. These were of different quality, but most of them made excellent bricks, and formed an admirable material for arching and securing the drifts and shafts.

The application of stone varied considerably; sometimes single slabs would be laid across the lode, or when the width was too great two slabs meeting in the centre would be used. Frequently they were applied in smaller pieces, put in as a flat arch, with the spaces at the top roughly but closely packed to equalise the pressure. If the nature of that pressure required it arches of all kinds were put in, from the pointed arch to the semi-circular and horse-shoe forms. Very great caution was requisite in deciding on the particular shape about to be employed, so that the thrust might be met by the greatest power of resistance. It was very common in levels to find arches inserted here and there to meet particular cases, and as subsidiary to timbering; but in some mines there were miles of regular arching, from 6 to 7 ft. high and 5 ft. wide, so as to admit horse work. Much of this work was done with dry stone, but there were cases in which it was necessary to use mortar in setting the stone as well as where bricks were used. In these cases it was a great point to obtain mortar of a hydraulic character. He recommended to the pupils the study of Sir Charles Pasley's book on the subject of mortars and cements, and they would find that a great many kinds of material could be used as hydraulic lime. In the older works on the subject, and in past times, much stress was laid upon the introduction of material brought from certain volcanic districts; and tufa and trass, a conglomerate in which felspar played a great part, were included in all the old compositions for setting bricks under water. While, however, they were fetching these substances from Naples and Rome, at great expense, abundance of much better substance for the purpose existed in the upper portions of the mountain limestone, stretching from Lime Regis to Redcar on the coast of Yorkshire. When, therefore, in the mountain limestone they had a series of beds of a dark colour, and having in its composition about 25 per cent. of other substances, besides carbonate of lime, it would be wise to try experiments as to its character, by drying, grinding it, and then placing it under water, to see if it would set and solidify as readily as other hydraulic lime would do. He need hardly add that if the trial were satisfactory the mining engineer had at hand a most valuable material for any kind of walling he might require.

Lecture XXX.—Having in the past lectures sketched the operations requisite in ordinary ground, where they might be conducted with facility, Mr. Smyth next approached the more difficult conditions and workings required by rocks of a decomposed character, or by running ground, which would tax the best energies and skill of those who had to carry out the work. It often happened that in a single level there would be various conditions of ground. Thus they might in one portion find a moderate use of timber sufficient, while at another it would have to be put in quite close, and, perhaps, at a third spot they could only advance by spilling. There were cases, too, in which double arches of stone would have to be used all the way round the level, with its shape approximating more or less to the circular, elliptical, or oval character. And, again, there were cases in which the strongest work could not be considered durable. In the first place, the foundations might be insecure, and then the best workmanship and the greatest judgment, combined with constant watchfulness, would be required to prevent a catastrophe. A second cause of instability was the tremendous pressure to be encountered when working at great depths; and thus in some coal mines, although the work put in was of the most excellent kind, and the levels at their starting from the mouth of the pit, and for some distance, secured by good masonry and strong arches, the pressure would after a time tell on the masonry itself, and the crush would cause the stones to chip away in wedge-shaped pieces at the joints. This rendered it necessary from time to time to repair works of even the strongest character. This could not be altogether guarded against; but something might be done by laying the stones in the arch in such a way as that, from their position, they would be still kept in their places, even when split, and by care that the pressure shall not operate in such a way as to dislodge the keystone.

Mr. Smyth next passed to the subject of shafts, which were the most important means of access to mines, and even in hilly districts, where long levels were used for that purpose, shafts were necessary for ventilation. The position of the shafts depended upon considerations as to the purposes they might have to subserve. If there were a considerable amount of certainty as to the nature and quantity of the mineral in a given area they might then beforehand draw up a regular scheme, and decide how many shafts would be necessary, and where they should be placed, so as to work out the mineral in the best manner with reference to the area and the length of time likely to be required. The dip must also be taken into consideration, and various geological accidents, such as the occurrence of heaves and faults, whether the beds dipped regularly, and whether the term of the lease was of sufficient length to render it advisable to sink at once to the lowest depth. If the lease were granted for only a limited time it would be advisable, in all probability, to make the shaft of less length, and work the beds from an intermediate point. Then there were always to be found certain spots which would prove to be much better than others. If the surface were hilly it might be necessary to have separate sets of machinery for each shaft, while under other circumstances the shafts ought to be so placed as to allow of both being worked by the same engines. On these points a considerable amount of accurate information ought to be obtainable, and so they would be able at starting to place the pits in the best positions. In the case of metalliferous mines it was far otherwise. There the operations were so entirely a succession of exploratory trials that it was most unlikely they would first commence at the spot which would ultimately prove the best place for the location of the principal pumping and raising machinery. Supposing they had sunk a shaft which proved not to be on a good portion of the lode, it would be necessary to sink a second, and, perhaps, a third shaft at a short distance from the first, and they would naturally ask how they were to determine where to put the permanent pumping-engine. This was a point of considerable difficulty. If they commenced at No. 1 shaft, and put up extensive machinery there, it was obvious that the great expense incurred would to some extent be thrown away if they should afterwards have to make No. 2 or No. 3 shaft the principal point of operations. The expenses would not be entirely thrown away, as No. 1 shaft might be rendered available for draining the mine by means of horizontal rods. In order that no great risk should be run, it would be preferable to erect temporary machinery at the outset, and then if the principal part of the lode had been struck it could be removed, and machinery of a permanent character erected in the most convenient position. Then, as to *form*, it would be found that generally the shafts of metalliferous mines were rectangular, while in collieries they were almost invariably circular or elliptical. There were a few exceptions to this practice in existence, as, for instance, in a coal district in one part of South Wales, where the shafts would be found to be not unfrequently rectangular in form. On the Continent the polygonal form was most common, ranging from 10 to 20 sides, while 16 were very common. Fine specimens of this form of shaft might be seen in the Department du Nord, at the mines of St. Emile, and in Belgium. In Mexico, too, there were some remarkably fine 8 to 12-sided shafts. In the Russian coal fields the shafts were often four-sided, but slightly arched. Size was an important consideration. Small shafts, although thought safer, were, as a rule, found to be unsatisfactory, particularly when the quantity of mineral to be raised was considerable. Pits of 4 or 5 ft. diameter were once common, but they might now be said to belong to an ancient school of mining, which was fast passing away. Thus, in the poor men's mines in Derbyshire shafts were often as narrow as a chimney, so that a man might get up or down like a sweep; and as they were only used for the purpose of working small things, which could not pay for the expenditure, this sort of shaft answered the purpose. The usual diameters of circular pits range from 6 to 16 ft., or 17 ft., while elliptical ones were sometimes as much as 22 ft. in the longest diameter. The size of rectangular shafts varied a good deal, according to circumstances. If the shaft were sunk on the lode when it was not required to put in machinery, 6 by 5 feet would be a good size; but if machinery were to be worked, 12 by 7 feet, or 10 by 6 feet, were usual dimensions. It was common to divide such shafts—one end being devoted to the pump-rods and sollars, and the other part for winding-up the material. In the Harz and Hungarian mines, where the lodes were large, the shafts were made on a corresponding scale, being often 18 or 20 ft. in length, by 6 and 8 ft. in breadth; and perhaps the most wonderful shafts in the world were those to be found in Brazil and in Mexico, where they were 30 feet across, exhibiting tremendous chasms, running down to a depth of 300 fathoms.

The next point for consideration was whether the shaft should be perpendicular or inclined, and there was no doubt that in stratified deposits the former was the best. Of course, when the seam was inclined at any considerable angle

it might be a question, but even then the wear and tear of machinery in an inclined shaft was so great that the balance of advantage would generally be in favour of the perpendicular. In metalliferous mines there was a great degree of difference in practice. In Cornwall, in Saxony, and in most districts where the lodes were on a moderate scale, shafts on the lode itself were looked on with much favour, while in the Harz and in Hungary they usually commenced working at once with perpendicular shafts. In metalliferous mines, however, it frequently happened that both systems came into play in one set of workings. For instance, in the submarine mines of West Cornwall the shafts were sunk perpendicularly for a certain depth, and then went off diagonally, following the lodes right under the bed of the sea.

GEOLOGICAL SOCIETY OF LONDON.

FEB. 5.—Warington W. Smyth, M.A., F.R.S. (President), in the chair. Arthur Humphrys Foord, Woodland-terrace, Blackheath; Rev. Robert Hunter, M.A., 9, Mecklenburgh-street, W.C.; Frederick Newman, C.E., Belsize-road, St. John's-wood; and Hugh Seymour Tremenheere, Tremenheere, Cornwall, were elected Fellows. The following communication was read:—

"On the Geological Structure of Argyllshire," by His Grace the Duke of Argyll, K.T., D.C.L., F.R.S., F.G.S., &c. The object of the paper was to set forth some of the author's reasons for not accepting the views propounded by Mr. Geikie in his "Scenery of Scotland, viewed in connection with Physical Geology." His Grace believes that, although the atmospheric agencies of waste have produced great modifications of the surface, the form of the hills and valleys has, in the main, been determined by the action of subterranean forces. In illustration of his opposition to Mr. Geikie's theory, he described a supposed case of the formation of a valley by atmospheric agencies, observing that, if the crumplings of the strata have not affected the present surface, a subsequent submergence and a fresh unconformable deposition filling in all the inequalities must have ensued, and that these new deposits must have been again raised along different lines of elevation. Taking this new deposit to be the Old Red Sandstone, the author asks how it was removed, and points out difficulties in the way of supposing the removal to have been either by submergence or by subaerial agencies. His Grace then stated that Mr. Geikie admits that the agencies of erosion have been guided in their work by the prevailing strike of the strata, which strike is followed along the same line by the larger faults, and by the anticlinal and synclinal axes—at least as regards the general trend. He then pointed out that, in reality, all the great physical features of Scotland take the same north-east and south-west direction. He, therefore, considered that Mr. Geikie had understated the case of the coincidence of certain physical features, and had entirely omitted all mention of others, such as the appearance of subsidence and dislocation to be observed in the Western Islands, and the relations existing between dislocated sedimentary strata and apparently intrusive rocks. In supporting his argument by special facts, the Duke of Argyll endeavoured to show that the whole valley-system of Argyllshire may be accounted for either by faults, foldings, subsidences, or anticlinals, mentioning in particular that Loch Tyne occupies the bed of an enormous fault; that Loch Awe lies along the line of a great subsidence of the metamorphic slates, and that the gorge of the Brander Pass lies along the line of a great fracture connected with the subterranean movements which brought up the granites of Ben Cruachan; with many other instances of a like nature. In discussing which he especially demurred to Mr. Geikie's theory that the tranverse valleys and gorges have been formed by two streams, each working backwards towards its own source, until the ridge which divided them was finally destroyed. His Grace also remarked that the mineral condition of the granites at the time of the subterranean movements was such as would facilitate the transmission of earthquake waves, and the condition of the slates was such as necessitated fracture when those waves were propogated beneath them. In conclusion, the author contested Mr. Geikie's statement of the symmetry of river-valleys and uniformity of mountain-heights, and contrasted the philosophy of the older geologists with that of the advocates of sub-aerial denudation.

On Feb. 26 the following papers will be read:—

1.—"Notes on the Formation of the Parallel Roads of Glen Roy," by C. Babbage, F.R.S.; communicated by the President.

2.—"On the Origin of Smoothed, Rounded, and Hollowed Surfaces of Limestone and Granite," by D. Mackintosh, F.G.S.

3.—"On the Enchroachment of the Sea in the Bristol Channel," by D. Mackintosh, F.G.S..

4.—"On a Striking Instance of Apparent Oblique Lamination in Granite," by D. Mackintosh, F.G.S.

5.—"On the two Plains of Hertfordshire, and their Gravels," by T. M'K. Hughes, M.A., F.G.S.

THE IRON TRADE—ENGLISH AND FOREIGN.

The different conclusions arrived at by different persons upon the same subject, according to the different points of view they take, are often very remarkable, and the advantages derivable from the consideration of those conclusions, of course, varies in a corresponding degree. In the Journal of Feb. 1 there was published the first of a series of letters (communicated to the *Times*), by Mr. SAMUEL PLIMSOLL, which are highly interesting, from the circumstance that Mr. PLIMSOLL distinctly states that his object was to ascertain how to promote his own interest, coupled with (but in a subsidiary sense) a tolerably earnest desire to benefit others. The chief object of all who attempt to augment their actual profits is to endeavour to ascertain how to obtain better results from a given quantity, or how to obtain equal results from a less quantity; and, taking coal as an example, Mr. PLIMSOLL observes that the best way one can do this is, after acquainting himself with the practice about him, to follow the fuel to those places where it is, from cost of transit, &c., most expensive, bearing in mind that "necessity is the mother of invention." Mr. PLIMSOLL first visited certain ironworks in Yorkshire, Lancashire, and subsequently parts of France and Belgium, by which means he obtained the requisite data for making a satisfactory comparison of English and foreign ironworks contained in his letters.

At the works of Messrs. NEWTON, CHAMBERS, and Co., of Thorncliffe, near Sheffield, it was found that about 55 cwts. of raw fuel was employed for each ton of pig produced. Here a much smaller quantity of coke is yielded per ton of coal burnt, especially in a high wind, when, perhaps, a ton of coal would only give 8 cwts. of coke. The ovens now used are ANDREWS', and produce more coke, (say) from 12 to 12½ cwts. per ton of coal, under favourable conditions. In the Dronfield district, which produces coke largely for Sheffield, it is generally considered that 50 per cent. of the weight of coal is yielded in coke. At the works of Messrs. COOPER, of Worsbrodale, about 3 tons of fuel are required to produce 1 ton of pig-iron, and to make 1 ton of cold-blast iron requires about 6 tons of coal. At Messrs. DAWES', at Milton, where coal, and not coke, is used, they use about 28 cwts. per ton of pig-iron produced. At the blast-furnaces at Elsecar, belonging to the same firm, the furnaces were 8 or 10 feet higher, and the fuel used somewhat less in proportion to the weight of pig-iron obtained. At the Park Gate Ironworks, near Rotherham, the iron ore used was from the Lincolnshire Trent Iron Ore Company and the Northamptonshire; about 50 cwts. of raw fuel were used per ton of iron. At the Holmes blast-furnaces, belonging to the same company, the proportions are about the same. The next place visited by Mr. PLIMSOLL was the works of the Barrow Hematite Steel Company, referring to which he says:—

"The quantities of fuel used in heating the ovens for the blast, and in producing the steam for propelling it into the furnaces, were much the same as in Yorkshire—that is to say, about 15 cwts. of fuel per ton of pig-iron produced. The fuel used in the furnaces was the best coke from the North of England (Darlington), and the quantity used in the blast-furnaces was somewhat less than in Yorkshire—say 20 cwts. of coke per 20 cwts. of pig produced, which I accounted for by the much larger yield per cent. of the iron ore, as the appearance of the tops of the furnaces was similar to the appearance of those I had previously seen. The mode of charging the furnaces differed, however, from that employed in Yorkshire, in which county advantage is either taken of a hill side to get at the top of the furnace on the level of it, or the charge is lifted bodily from the ground where the site of the works is level. In this case (Barrow) an inclined plane leads from the sidings, where the trucks of ore, lime, and fuel are unloaded, to a platform built round the outsides, and about 12 ft. from the tops of the furnaces. This inclined plane has a railway upon it, which carries a stage, a section of which, from front to back, resembles a scalene triangle, of which the longest side is on the inclined plane; the next forms a level stage, and the shortest connects the others in a vertical line. On the second, which is a level platform, the barrows, when filled with ore and coke, are wheeled, the men accompanying them in their apparently perilous ascent. The stages are without side-rails, as they would delay the removal of the wheelbarrows. Arrived at the top, the contents are rapidly discharged into the furnaces through mouths closed by suspended flaps, which offer no obstruction to the inward passage of the material, yet materially shelter the workmen from the heat. A small portion of the steel was broken by tension in my presence. The section had an area of ·421 an inch, I think; the strain was 7000 lbs.; at all events, the strain per square inch of area amounted to no less than 42 tons 6 cwts., which seemed to me to be extraordinarily large, though not larger than the average yield of steel will bear. The pig bed was in the open air, and is formed by burying or surrounding with sand a piece of wood shaped like a pig of iron; after the sand has been firmly pressed to the sides of the wood the latter is lifted out of the sand. The work is done by hand. I name this for a reason which will appear later. No puddling is done here, as the pig-iron is broken, put into the air-furnace, and then run at once into the Bessemer cupola. After about 17 minutes' exposure to the blast of this wonderful and beautiful process, the proper proportion of spiegeleisen is poured in, and the whole discharged into ingot moulds, after which it is hammered or rolled into the various forms and shapes required—rods, bars, rails, railway-axles, railway-wheels, and numerous other forms. Spiegeleisen contains about 5 per cent. of carbon. As steel requires about one-quarter per cent. of carbon, more or less, according to the temper required, and, as the whole of the carbon is burnt out of the melted pig-iron by Bessemer's process, the quantity of spiegeleisen is adjusted nicely, so as to give just the proportion required. The Barrow Hematite Steel Company are now turning out iron and steel at the rate of 250,000 tons per annum, the manufacture of which consumes in raw materials from 3000 to 4000 tons per working day."

At the Eagle Works, Shropshire, he saw JEFFRIES' and HEWES' furnaces, both of which seemed to him to be a considerable improvement upon the common-necked furnace; he also visited Dudley, Dudley Port, and Tipton, and ascertained the quantity of fuel used in all these cases, but does not give a separate enumeration of them, as they were all summarised (correctly in the aggregate) by Mr. RYLAND, "that it took from 2 tons 7 cwts. to 2 tons 14 cwts. of fuel to produce a ton of pig-iron; that this was exclusive of all subsidiary processes, as heating the blast, making steam, and roasting ore (when the latter was done anterior to placing it into the blast-furnaces)," whence it appears that the expenditure of fuel in Staffordshire is a little more than that used for the same purpose in Yorkshire. At the works of Sir JOHN BROWN the puddling-furnaces were supplied with the best hard coal, and about 2 tons of this were used in making a ton of bar-iron from the pig-iron, including the re-heating, of which, of course, the larger part would be consumed in the puddling. Here, as elsewhere, he observed that a portion of the area of the firing-hole was open, allowing a considerable influx of cold air. Here he had again an opportunity of witnessing the Bessemer process, and considering how desirable and possible it was to design a less cumbrous and expensive plant for conducting this interesting and most important process. Referring to his visit to the works of Messrs. FIRTH and Co., he says:—

"I examined SIEMEN'S new process for heating the air-furnaces. He makes the fuel into what I may call rough gas, in furnaces apart by themselves, called generators. It thence passes through what are called accumulators into the furnace where it is used. A current of air is also introduced, the two being in such proportions that perfect combustion is obtained. This method applies the heat more equally to the mass than can easily be done where the ordinary furnace is used, thus saving the burning off of the corners and angles, which otherwise results sometimes from the long time required to heat large masses. A not less important, but as yet unadopted, advantage of this system appears to me to consist in the great facility it offers for divesting the gas of the sulphur contained in the coal. The importance of this is not yet sufficiently known. In re-heating, the bars are cut into (say) six or eight lengths of 4 ft. long, which are placed one upon the other to the end that they may, when sufficiently heated, be rolled into one. As the lengths of bar or slabs do not, of course, touch each other at all points of their surfaces, and the iron, especially when in a state of fusion or white heat, has a great affinity for the sulphurous acid present in the flame, the ease with which they may be united thoroughly is greatly weakened. Happily, the hard coal generally used has but little sulphur; and, as the respective surfaces of the slabs are much enlarged by rolling, the sulphuret of iron formed upon them in the furnace is so far spread and attenuated as not yet to have produced any very bad result, except in one instance, which I shall notice in my fourth and last letter. Blacksmiths, however, will understand this evil tendency, and by practice and experiment at length arrive at the coal which will enable them to get a good weld. If sulphur is present he may hammer as hard as he likes—the weld when strained upon will open, and the iron will break. The cost of purifying the gas, so far, would be almost nothing, as a chamber filled with the borings, filings, and planings of the fitting-shop, having been first well oxydised by exposure to rain or a little water, would take it all up from the gas on its way to the accumulator, and the filings, &c., could be used again and again, nothing but a little exposure to the open air being required to restore their efficiency."

Neither South Wales nor the Middlesborough districts, nor Scotland, were visited by Mr. PLIMSOLL, so that the comparison must be considered to apply only to the districts mentioned. In his continental tour the first place visited was Marquise, France, where the ironworks of Messrs. PINART FRERES are situated, and his description of the coking process there is particularly interesting:—

"Whereas in England 60 per cent. of coke from a given weight of coal is considered an excellent result, 80 per cent. was obtained here day by day; that from two ovens, each about the size of a cottage house, no less than 18 tons of coke per day from each—that is, 36 tons, was produced; that the place was as innocent of smoke as Snowdon; and finally, that the coke was of excellent quality, probably harder than any produced in this country, and so far better for blast-furnaces. The labour also was so much reduced by this system that three men and a foreman managed the whole. I will attempt a brief description of this oven, of which there were three at this place:—Make 18 vertical columns of fire-brick, the horizontal area of each of which shall be an oblong rectangle, containing an interior area of 2 ft. 6 in. by 20 in.; let these have narrow vertical slits in the sides at various elevations; place nine of them in a row, having their broadsides *vis-a-vis*; so also place the other nine as close together as their bases will allow (they all taper slightly inside and out towards the top); now build a wall close round the parallelogram so formed, fire-brick inside, common stock outside; now flat-roof the whole space enclosed, leaving holes, however, for the top of each shaft or chimney to protrude, and put a hand-rail round the top of the outer walls; now we make a tunnel under each row of columns, into which, through the arches of each, there are apertures leading vertically into the interior of the respective columns; lay a line of railway through each tunnel, and one bestriding each of the rows of apertures above, and your oven is complete. Stay, you also leave through the sides of the outer walls little holes closed by dampers opposite the vertical slits I have spoken of in the walls of the interior columns. The columns being placed close together at the base, and the outer walls close to them, there is an interior space equal to the taper between each column and the other, and between the whole and the outer walls. When built they are started by placing fires of wood, &c., in each column. Let us suppose them in activity. Call *a, b, c, d, e, f, g, h, i* one row, and *k, l, m, n, o, p, q, r, s* the other; nine are emptied every 12 hours, thus giving 24 hours for the whole process of hard coking, not four days. They do not empty them in consecutive order, but *a, c, e, g, i* of one row, and *l, n, p,* and *r* of the other, for this reason—the whole being at a white heat (seen through the exterior holes), when (say) *b* is discharged, the input of 24 cwts. of cold coal slack would tend to cool the shaft, instead of coking the coal; the heat of *b*, however, is helped by *a* and *l* and *c*, which have been burning some hours; *b* thus helped by its neighbours on three sides makes the coal in its interior give forth gas, which, escaping through the narrow vertical slits I have referred to in its sides, is met by a current of the atmospheric air admitted through the little dampers in the outer wall. This current is so nicely adjusted that perfect combustion, just that, and only that, is effected. This keeps all the interior in a dull white heat. When *b* is well on its way, the interior mass heated, and the *maximum* amount of gas is exuding, then its next neighbours are emptied of coke, and refilled with coal in this way:—The interior aperture of each column is continued downwards through the arch of each tunnel, and is closed from below by a cast-iron trap-door; the coke having been allowed to descend, and having been taken away in a boiler-plate wagon, lined with thin fire-bricks, and quenched, the trap-door is immediately turned up and secured, and a man above empties a scoop of small ashes into the column to protect the ironworks from the action of the fire. A boiler plate corve, containing 24 cwts. of small coal, is wheeled over, an aperture in the bottom opened, and in as little time as it takes to write it, the corve being hoppered, the contents are shot into the column. A stone slab is now put into the interior, which rests upon an inner flange near the top, a little wet clay roughly plastered round the joint, and the oven is again in full activity. In this way the whole 18, 36, or 54 are filled and emptied every 24 hours, coking about 60 tons of small coal into coke of exceptionally good quality, and in quantity equal to 80 per cent. of the coal used."

Owing to the illness of the managing partner the ironworks could not be examined, the assistant manager not feeling at liberty to grant the permission, yet it could be seen without the permission that not a particle of smoke was given forth either from the ironworks or coke ovens. The coal used was exclusively English small coal, shipped on the Tyne, the Wear, and the Tees. One of the blast-furnaces being in the valley, however, we could see from the road to the station the men at work charging it. They were comfortably under cover. A good room, roofed and windowed, surrounding the top of the blast-furnace, there was not a particle of either smoke or flame issuing from this furnace. The pig-bed Mr. PLIMSOLL describes as being like a small market place, well roofed in to protect the workmen from the weather, and the owners were not, therefore, compelled to employ exclusively men in the very prime of manhood. In Staffordshire he observes, by way of comparison, that he saw four blast-furnaces tapped. Almost before the iron issued, the rain began to fall very heavily. All who could got under cover; it was impossible, however, for the men, who in rain which thoroughly saturated the clothes on their backs had to remain at their posts exposed to the scorching heat of the metal. From Marquise he proceeded to Mons, in Belgium, where he obtained some valuable information in connection with the manufacture of artificial fuel.

"At Mons, the fires of the hotel were made partly with coal and partly with small moulds of artificial fuel, composed, as I afterwards discovered at Liége, of the dust of the *charbon-maigre*, mixed with a little clay (*la terre jaune*) and water; this coal being of the nature of the Welsh coal will not coke, and is used up in this way. The mode of manufacture is simply to lay down the coal at the door of the house, to spread a little clay, and then, after pouring water upon it, to tread it well together; it is then pressed (by hand merely) into a hoop, like an oval brick-mould, and put in rows in the cellar to dry. That is all. It makes an excellent fire, however. All the small coal of the bituminous measures is coked to make cast-iron. Arrived at Charleroi, I visited the Sacré Madame Colliery, where they are working the *grande sablonière* or great bed (a vein 12 in. thick) at a depth of over 800 yards, and then proceeded to the artificial coal factory at Gosselies. The engineer at Sacré Madame told me that they don't use furnaces at the bottom of the upcast for ventilation, partly to avoid the risk of explosion at the furnace (which sometimes happens in England), but chiefly because 1-20th part of the coal required by a furnace will make steam for an engine to work fans, which suck the air out of the pit. These fans they can work and control, and are, therefore, independent of those atmospheric influences to which some of our greatest calamities have been ascribed—the damp, heavy, foggy atmosphere of early winter. One of these fans (of which they have three couples) will draw 34,000 cubical kilometres af air per minute. He next inspected the engines, and afterwards the boiler-grates. The boilers were remarkable for their extreme length. The arrangement was two very long boilers of about 18 in. diameter, 2 ft. apart; from the inner upper services of these angle iron brackets carried a boiler of 3 ft. 6 in. diameter; the interval was about 4 in. They thus secure a large radiating surface without the great expense of tubular boilers. From here I went to the tip at the railway. They fill the large coal into the wagons by hand; it is worth 22 frs. to 24 frs. per ton at the pit for the Paris market; the rest sells for 11 or 12 frs."

It was at Charleroi, too, that Mr. PLIMSOLL had the opportunity of seeing the process of puddling with smudge. Accompanied by Mr. JULES HAVREZ, he visited several ironworks and forges, as those of DE DORLODOT and GILLIAN and Co., at Chatelineau. At the DE DORLODOT works the puddling-furnaces were fed with smudge coal. The weight of coal used was for a ton of bar-iron 15 cwts. of smudge. They were extremely careful to close the firing-hole, and to cover the puddling-hole as often as possible, so as to force all the air through the fire, and to prevent any lowering of its temperature by the admission of air other than through the fire. At this place all the ashes are collected from each furnace fire-hole, and are removed to a place where workpeople shovel it up into large square sieves supported on two poles or long handles, which support the sieves over a large wooden trough; the sieve is then shaken to free the contents from the very small cinders and the dust, called "breeze" in London, and they then pick out the clinkers or slag, which are used for repairing footwalks, and the cinders or little cokes are used again with the smudge, which they greatly improve.

From this place he visited the furnaces of Messrs. GILLIAN and Co., and inspected their coke-ovens and blast-furnaces. There was no smoke here, either from the ovens or from the furnaces. The proportion of coke produced here and at the adjoining works varies from 75 to 80 per cent. of the coal used. As to the making of smoke, they say generally throughout the district that "they cannot afford to make it, the coal being too dear—they make steam instead." To produce 100 tons of pig-iron in Belgium, Mr. PLIMSOLL found that in the aggregate 146 tons of coal was used, whilst in Staffordshire the weight of coal used averages 252 tons; in Yorkshire, taking the estimate before given, 225 tons. But this is not the whole case as to economy: the richest iron ore he found in Belgium contained only 36 per cent. of iron (the average, he thinks, does not exceed 27 per cent.), and it has a most intractable and extremely hard stone, while it is well known that our *average* is above that, while the major part give 40 to 45 per cent. Several of our English ores, as the Lincolnshire and Northamptonshire, have, from their proximity to the surface, absorbed a very large quantity of pure oxygen, which greatly facilitates their reduction in the furnace. He then proceeds to compare the Belgian and English systems, observing:—

"It will be, therefore, clear that the Belgian ironmasters get, on a very moderate calculation, rather more than double the work out of a ton of raw fuel, coal or slack, than we do in the blast-furnace. The same results are true also of the subsidiary processes of roasting, heating the blast, and making steam. Nor is the explanation far to seek. In England, without exception, so far as I saw, the ironstone, fuel, and lime are shot into the furnace from a large barrow or corve, containing from 4 to 5 cwts.; say it is coke now shot, it lies in a compact mass, and much of its effect is lost; say it is ironstone, it lying altogether also requires a much larger amount of heat to reduce it than if it were in smaller quantities, with fuel between each; the ironstone and coal also are just put in as they are, in large, some of them very large, pieces. If to avoid this lumping of the fuel, ore, &c., the body of fire is kept low enough to allow the material to spread a little when shot, then it screens itself, the larger pieces flowing to the skirts of the respective heaps, while the cone consists of all the small, which throws the furnaces "out of condition," as it is called, and renders occasionally a much larger charge of coke necessary to disengage the agglomerated but not melted masses which adhere to the sides of the furnace. Now, combustion is simply a chemical process, and all chemists know that the comminution of their materials greatly expedites and facilitates their operations. The Belgians act upon this knowledge, and are careful to break their ironstone into pieces no larger than an orange, and their fuel into pieces no larger than a potato. Then, by always keeping the furnace full up to the top, they are enabled to add the materials with the shovel. This they do, and by giving a turn of the wrist as they discharge the contents of their shovels, just as a man spreads broken stone on a macadamized road, they ensure its even spread and distribution. Indeed, I have seen a workman, when two pieces of coke were lying side by side, separate them with the point of his shovel and put a piece of ironstone between them, to give them something useful to do, instead of helping each other to burn. An English blast-furnace, as the most cursory observer is aware, emits a large body of smoke and flame, which can be seen at night for many miles. A French or Belgian furnace emits no smoke nor flame at all, and so little heat that I have myself walked over the top of it, *standing on the materials*, which were then gradually descending into the furnace. * * *

By care and economy we could make about double the quantity of iron we now make without any further expenditure of fuel. Under these circumstances, I would say first to the workman engaged in puddling, 'If you have 10*l.* saved, go at once to Liége; you can book through from London, by the London, Chatham, and Dover Railway for a trifle; lodging can be had in any of the villages between Liége and Namur—say Malherbe or Huy; make yourself master by observation, and also good hard work, of their mode, and then come back, and say to some large maker of bars, 'I will undertake to do the puddling of one, two, three, or more furnaces at so much per ton of bars produced, finding my own coal;' and if in two or three years he has not money enough to go into business for himself it will be because he has squandered his makings. To the ironmaster I would say, 'These statements very nearly concern you and those you employ. They are either true or false. Go to the places indicated and judge for yourself. If you are incredulous as to the possibility of getting such great results from the economic and scientific use of fuel, a visit to the new terminus of the Midland Railway Company at Agar-town, London, before you start will show you. There is a brick-kiln, the invention of a German; they burn bricks made with admixture of breeze at the rate of 3 cwt. of coal per thousand, and from clay without breeze at 4½ cwt. per thousand, in each case not much more than one-third what is ordinarily consumed for the same purpose.'"

In conclusion, he recommends to the trade generally an Ironworkers' Exhibition for September next, remarking upon the enormous advantages agriculture has derived from the exhibitions of the Royal Agricultural Society. At their first exhibition they had but five kinds of implements, now they have two score or more. Then, their production of mutton and beef per acre was just half what they produce now. Surely it is as important that a puddler should produce a ton of bar with half the present amount of fuel as that Hodge should turn a straight furrow; that the manager of the blast-furnace should get the *maximum* of benefit from the material used as that a man should be rewarded with a new coat and a pair of breeches for raising a family of ten on as many shillings a week without parish aid. He suggests that 500*l.* should be given in a series of prizes to the puddlers who should most quickly and with least consumption of coal get a ton of bloom under the hammer from the pig. You would by by these means subsidise the brain as well as the bone and muscle of your workmen, and the form and construction of their furnaces would soon be an object of interest to them in their leisure hours. Thus the faculty of perceiving existences and their relations could be developed, and many suggestions of the highest value would emanate from the workmen themselves. A less expensive and cumbrous plant for conducting the BESSEMER process would form a capital subject for a prize; the best model of puddling-furnace; a better mode of preparing the pig-bed. It would be extremely important, too, to have a few cheap and simple tests for sulphur, gas, and evaporative power in coal. Such an exhibition would be interesting even for the general public; the reduction of the ores, its various sorts, the puddling, and the beautiful BESSEMER process, would bring spectators from all parts of the country, and also from all parts of Europe. It would pay its own expenses; it would do incalculable good. The plant would let for 20 per cent. per annum, and be available from year to year. The prizes offered would bring skilled workmen from France and Belgium. They would win the prizes the first year, obtain here employment at high wages, and the year after, English energy and attention once aroused, we should be as far ahead of our continental rivals as they are now most certainly ahead of us.

To show that he has not taken exceptionally favourable cases on the Continent, he remarks that when our people have ovens like those at Marquise and Seraing he will ask them to go to St. Etienne (Loire), or to Bessages, near Marseilles, where they will see that after obtaining coke equal to 70 per cent. they distil the products of combustion, and get graphite, benzine, alcali, sulphate of ammonia, hydrochloride of ammonia, and also the carbonate, and these latter in such quantities and of such commercial value that if the coke vanished into air they would still realise a profit of 2 frs. 50 c.—2*s.* 1*d.* per ton of coal used. They have had 188 ovens in activity for seven years, and they are now building 150 at Bessages. He reminds us that it is but a short time since tar was gladly given away by gas companies; they now realise a handsome annual sum for it, and the firms who buy it are making large fortunes by producing benzole treated with nitric acid for coal-tar dyes, oils for lighting and lubricating purposes, asphalte, and a dozen other things.

THE SLATE TRADE.—A valuable little pamphlet, containing the reprint from the *Mining Journal* of an interesting series of letters on "The Slate Trade in North Wales," by Mr. JOSEPH KELLOW, the well-known quarry engineer, has just been issued. The objects aimed at throughout the correspondence are—to show that an exhaustless store of wealth remains undeveloped in the leading ranges of slate rock in North Wales; that in order properly to apply the capital subscribed for opening up this hidden treasure it is of the utmost importance to secure thoroughly practical management; to show wherein the future can benefit from the experience of the past, by adopting measures agreeable to order and system throughout the stages of slate manufacture; and to point out the index by which every quarry undertaking of merit can not only be known but successfully and profitably worked; thereby demonstrating the fact that quarry enter-

prise is a road to wealth unequalled by any known channel of commerce. Such being the programme Mr. Kellow decided upon adopting, his long experience of over a quarter of a century as a quarry engineer was ample to enable him to dispose of it satisfactorily in the twelve letters now reprinted. The letters contain information which will prove alike valuable to the practical quarryman and to those pecuniarily interested, and the form in which they are now issued is a very convenient one.

ADAPTABILITY AND PRACTICABILITY OF BORING MACHINES IN CORNISH MINING.

In response to an invitation from Capt. William Teague, manager and principal proprietor of Tincroft Mines, Camborne, a large number of mine agents, representing the most important mines in Cornwall, met at Tincroft Mines on Friday to witness Doering's Boring Machine in full operation. Among those present were Capt. William Teague, purser and manager of Tincroft Mines; Mr. Doering, of London, inventor and proprietor of the machine; Capt. Joseph Vivian, of North Roskear Mine, Camborne; Capt. Josiah Thomas, Dolcoath Mine, Camborne; Capt. Williams, Charlestown United Mines, St. Austell; Captain James Evans, Nance, Redruth; Wm. Teague, jun.; Capt. Pascoe, South Wheal Frances, Illogan; Capt. Puckey, Par Consols, Fowey; Capt. Joseph Jewell, West Tolgus, Redruth; Capt. Charles Thomas, jun., Cook's Kitchen, Camborne; Capt. William Thomas, jun., North Crofty, Illogan; Capt. Garby, East Pool Mine, Pool, Illogan Capt. Toy, South Crofty, Illogan; Capt. Gray, Clifford Amalgamated, St. Day; agents of Wheal Kitty, St. Agnes; Mr. Mark Guy Pearse, Camborne; Mr. Reginald T. Grylls, Pendarves United, Camborne; Mr. F. W. Dabb, Wheal Basset, Redruth; Mr. T. T. Whear, Camborne; Mr. P. Vincent, Camborne; Mr. H. Wickett, Redruth; Mr. Heard, Truro; Mr. West, St. Blazey; Mr. Shields, C.E. London; Mr. Hocking, engineer, Redruth; Mr. Michell, Redruth; and Mr. R. Paull, Redruth.

The machine is worked by means of compressed air by an engine at the surface, which is of 7-horse power, the air being carried down to any given level by means of suitable pipes, and when working at full speed will bore in the hardest rock an inch per minute. Several of the gentlemen named above went underground and watched the machine at work, and expressed themselves highly pleased with its capabilities and success.

The company subsequently sat down to an excellent dinner prepared in the account-house. Capt. TEAGUE presided, and after the usual loyal toasts, said: I have invited you here to witness the experiments of Mr. Doering's boring machine in practical use. I thought it was a duty incumbent on me, that we might best inform ourselves as to its merits, and elicit opinions on the subject. My own conviction is that the introduction of boring machines in connection with Cornish mining is as important to that interest in these days as the improved means of locomotion by the steam engine is over those that it has superseded. I wish to have the value of the machine thoroughly tested by practical men, and their views taken upon it. Great credit is due to Mr. Doering, and I trust that his experiment will be productive of much good. Personally I have great confidence in the machine, having put it to work in ground that has tested its merits—the hardest ground in the district—in which it has worked well, and I hope these machines will come into general use. We are all practical men here; most of us have handled the mallet, and I hope we shall give our unbiassed judgment on the merits of this machine. The prosperity of four or five years ago made us oblivious of the fact that men were being paid wages they did not earn. In mining we have depended too much on manual labour, and I am glad to see a machine of that sort introduced by which we shall not only be less dependent on manual labour, but by its means be able to contend with the foreigners. The prices of tin and copper are so low that we must introduce machinery, which will enable us to battle with the exigencies of the times. (Applause.)

Mr. DOERING, patentee and proprietor of the machine, said—"I am delighted to see so many well-known and influential gentlemen connected with the Cornish mining interest assembled here to-day for the purpose of inspecting and considering my rock-boring machine. I feel much indebted to Capt. Teague for having promoted this meeting, more particularly as this extreme kindness on his part was unsolicited by me. It is two or three years since I took up the question of rock boring by machinery, and nothing short of an absolute conviction in its ultimate triumph over hand labour could have induced me to devote myself exclusively to the perfecting of a system which, like all new things, is sure to meet with at least *vis inertia*, if not actual opposition, even on the part of those destined to reap the greatest benefit from it. I had that absolute conviction, however, and persevered; and if finally I have realised a machine and stand more simple, compact, and efficient than any others, it has only been effected after a long series of costly experiments with less prefect machinery, both of my own and other people's invention. I am happy to see rock boring by machinery spreading rapidly. This is more particularly the case on the Continent, where its real value has been fully established. I could not, however, wish for more conclusive evidence of the prospect of its speedy general adoption in Cornwall than the fact of the invitation issued by one of the most distinguished of Cornwall's mining captains, in virtue of which we are now assembled, especially as Captain Teague has had ample personal experience of the working of my machine in the Tincroft Mines. A few general remarks on the advantages of rock boring by machinery over hand labour may not be out of place on the present occasion, and I trust I may be excused for volunteering them. In the first place, I would submit that the benefit derived from driving a level in one-third the time required by hand labour can scarcely be exaggerated. It means, on the other hand, a return on invested capital in one-third the time requisite for such an end by the system at present in use, thus rendering profitable an adventure which might be otherwise commercially impossible. Cornishmen, like their neighbours, wisely consider that the quicker the bird in the bush becomes a bird in the hand the better. Secondly, it means that the general expenses of a mine in a given time are spread over a yield three times greater; and how this result will affect the price of the mineral brought to surface I need scarcely tell you, whose appreciation in this respect is much keener than mine can possibly be. That I am not overstating the economy in time effected by the machine will be patent to all of you who have seen Captain Teague's statement which appeared a few days since, and I feel assured that such a statement, coming from such a source, cannot have escaped anyone interested, as you all are, in mining enterprise. In addition to the increased speed in driving a level there is also a most important advantage to the employer of a rock-boring machine in the diminution of wages paid per fathom driven. In ground of ordinary hardness the saving in wages will not be less than 25 per cent., and in very hard ground it will amount to 35 per cent. Moreover, the holes bored by the machine are invariably deeper than those bored by hand, and, consequently, there are fewer of them per fathom. According to the published report of the Vieille Montagne Company, this difference with the Doering Sachs machine resulted in a saving of 10 per cent. in the number of holes bored in the autumn of 1866. An important economy is also effected in the cost of repairing the drills used by the machine per fathom over that necessary in the case of hand-boring, for five drills are used in the hand system to one in machine work. The improved ventilation of the ends by the use of boring machines working with compressed air is a consideration which recommends itself, as well on philanthropic as on commercial grounds, for whilst promoting the health of the miner it renders continuous work possible to him in places where without it such a result could not be obtained. As to the question of expense attending the the repairs of a rock-boring machine, Capt. Teague will no doubt willingly corroborate my statement of the fact that my engine has worked continuously at the Tincroft Mines from the 5th to the 30th of January without undergoing any repairs whatever: it has bored 277 holes during that period in ground of great hardness. That so favourable a result has never before been recorded of any other machine arises from the greater simplicity of my system, coupled with the perfectly independent action of the piston and the drill. I shall not tax your patience further by discussing the details of the machine you have seen at work to-day, but I shall be happy to answer any questions you may desire to put either now or at any future time concerning it. I may, however, be permitted to observe that the general results I have just given you are not paper results, but have been established by a long experience of underground work. My machine, which I am confident will long continue to work, and is now working in Tincroft Mines, will furnish you with ready means of verifying the statements I have made. I trust and firmly believe that before long it will find its way into many other mines, and that it will prove no mean agent in giving fresh impetus to the mining enterprise of this county. By reducing the cost of extracting your mineral it will help you, and I believe very materially, in maintaining your ancient supremacy; and by enabling you to call into fresh activity mines that you are now obliged to abandon, I trust that it may prove of no small benefit to your working population, by opening out new fields for their employment. (Applause.)

The CHAIRMAN then invited a discussion on the question. He saw several engineers present, and he would be glad to hear their views. He had much pleasure in proposing the health of Mr. West, of St. Blazey.

Mr. WEST said he thought they should do all in their power to assist in this highly important matter, and he was pleased to see so many practical men around that table for that purpose. He thought that the expense of the engine at surface might be done away with, and if there were a difficulty in attaching gear to the pumping-engine of the mine, they would have to resort to hydraulics. The system of dressing ores as practised in the country four or five years ago if adopted now would leave no profit, and the introduction of the boring machine in underground operations will work as great and improved a change also in that department of mining, and he thought it an important era in connection with mining, and he hoped they would give the machine a fair trial. He could see that the machine was not perfect, but still it was a great success, and the inventor would undoubtedly from time to time make such alterations and improvements in its construction as the peculiar circumstances of its adaptation required. He would state that they now had a course of ore before them in Phœnix Mine which they could not see under the ordinary system of mining in less than five years. He should be glad to see one of Mr. Doering's boring-machines set to work there at once, and if it cost the same money to drive the level, and if they saved half of the time, he thought that a great gain in itself. (Applause.)

Mr. DOERING said the first machines he started were in Prussia, and they were answering well. He did not think the machine would act well if connected with the pumping-engine.

Mr. WEST said in that case the next best plan would be hydraulics. You could get a pressure of from 100 to 300 lbs. to the square inch, which he thought would be sufficient, and do away with the expense of the engine at surface. Hydraulic power, comparatively, was not known much in the country—probably not so much as it would be. He was now making three hydraulic engines.—Mr. JOHN HOCKING, jun., supported Mr. West's views.

Mr. DOERING then gave his views at some length on the importance of rotary motion over that of direct action. As this was a matter simply of detail, the question was allowed to drop.

The CHAIRMAN said he had sent his invitations to mine agents from the Land's End to St. Austell, and if any of those gentlemen found it inconvenient to attend that day the machine should be open to their inspection at any future time.

Mr. WILLIAMS, of Charlestown United Mines, said he took the present opportunity of thanking Capt. Teague for his invitation to attend that meeting. He was certain that a more rapid method must be adopted for the development of their mines, and they could not do better than take Mr. Doering by the hand in his great improvement of that principle. He thought the baneful effects of the extent system would militate against the general introduction of the machines into Cornish mining. He spoke at some length on this subject, and submitted that this would have to be altered. For men to have to work in only the short extent of 3 ft. high—[A VOICE: We don't do that down here]—and upwards was manifestly wrong, and if with all that they could only get from 40*s.* to 50*s.* per month this was the means of driving the best men out of the county and putting the lazy man on a level with the intelligent and industrious. (Applause.) He found the total cost of the engine, machine, and pipes to be about 560*l.* In addition to this must be set down the fuel for working the engine, the cost of the engineman, and also the cost of the men in charge of the machine. Let them contrast it with what had been paid for driving with manual labour. There was no question that the machine would wear well enough He had seen it that day bore 19 in. in 19 minutes, but of course there was no computation for time lost in putting back the machine for blasting, bringing in the machine again, putting it in position, and blocking it up. He thought if it only alleviated the physical labours of the miners a great success would be achieved but he was of opinion it would save 25 per cent. in money as well as time. He had asked one of the men in charge of the machine how he liked working it; he (the miner) said "he would rather work the machine for a fortnight than use the borer with his hands two hours." He thought that the introduction of such machinery would benefit the adventurers as well as the whole mining interest, and that Cornish mining would attain that *status* which it once proudly held.

Mr. Shields, C.E., Mr. Hocking, Mr. M. G. Pearse, Capt. Pascoe, Capt. Josiah Thomas, Mr. Reginald T. Grylls, Capt. Jewell, Capt. Wm. Teague, jun., Capt. Puckey, Capt. Joseph Vivian, Capt. Evans, Capt. Toy, and Capt. Charles Thomas jun., all spoke of the efficiency of the machine, and were agreed that it bored well enough; but the question arose whether the machine could command the best positions in boring, so as to be at all times effective. In other words, would not the holes bored by manual labour in some positions command or ensure greater success in blasting?

Mr. DOERING asserted that not only could the machine be brought to bear in every position that manual labour could attain, but also in such positions that manual labour could not attain. (Applause.)

The question of cost at per fathom for driving the end having been asked, Capt. TEAGUE said they paid 18*l.* per fathom to the former "pare" of men, but they could not tell the actual cost in connection with the machine as yet, from the fact that their men were new to the business, so to speak, and had a great deal to learn in connection with the working of the machine. This in commencing could only be expected. Notwithstanding the lets and hindrances they had met with at starting, he was well pleased with the progress they had made. The experiments were conducted in the 184 fathom level below the adit, requiring 2120 feet of pipes from the engine to the machine, and it had driven over two fathoms in the hardest tin capel within a month, whereas by manual labour scarcely one fathom of that distance could be accomplished.

Mr. M. G. PEARSE read during the meeting Dr. Foster's report of Mr. Doering's machine at the Altenberg Mines, in Prussia. [Mr. Bilhary, the manager of the mines, has kept a careful record of the results attained by Mr. Doering's machine in comparison with hand labour. Dr. Foster says—"These results were obtained during a long and careful trial. I have thought it better to give a full translation of this rather than any remarks of my own." The rock in which the work was carried on in both cases was a jointy but very tight quartoze, breaking off short, and in other places full of vughs. This dolomite may, therefore, be looked upon as a very unfavourable rock. By handwork 10 ft. were driven per month, with six men, two working at a time, four and eight hours' shift; the wages were 12*l.* 16*s.* 1*d.* per fathom. With a machine two men and one boy suffice for each 10 hours' shift, only four men and two boys were wanted, and thus one man was saved. The work is done thus:—The men set up the machine, and place the hole as they think best, and leave the actual boring mainly to the boy, and in the meantime bore smaller holes in places that are favourable for hand work. The machine rests on Doering's stand, which allows it to be brought in every desired position, so that horizontal holes can be bored in the back or floor with equal ease. During the work, and especially in the two hours between each change of shift, the stuff is cleared out and trammed away by boys; this work is not included in the main wages. In the 10 ft. driven by hand work 112 holes were bored, each about 15 in. deep. They blunted from 16 to 24 borers with steel bits, on an average 20 for every 15 in. bored. This makes 2240 for the 10 feet driven. In the 3 fms. 5 feet driven by the machine in a month 163 holes of 19½ in. deep were bored, and 11 holes 11 in. deep by hand. For the 163 holes the machine bored 619 borers were blunted, and for the 11 hand-bored 150 were blunted, altogether 769, or 200 per fathom, being about a seventh part as many required by the machine as by hand labour. In those mines the smiths' cost with hand labour is 12*s.* 8½*d.* per fathom; by the machine, 5*s.* 5½*d.* A comparative trial on a small scale on the same rock gave the following results:—Two men bored by hand, the one striking and the other turning, and working in a most favourable position, 18 inches in three hours, or 6 inches in an hour. In two hours the machine bored 36 inches, or 18 inches per hour. Dr. Foster remarks in this case—"We must recollect we are not dealing with mere experimental machines, but with machines that have stood the severest test of underground work for a considerable period. In face of the facts detailed there will be few persons who will deny the advantages and practicability of using boring machines underground. The more I reflect on the matter the more I feel convinced that boring machines will soon effect a revolution in Cornish mines." These remarks were greeted with much applause, and the proceedings throughout were viewed by many as being the inauguration of a new era in the history of Cornish mining.—*Western Morning News.*

Meetings of Public Companies.

MARIQUITA AND NEW GRANADA MINING COMPANY.

IN LIQUIDATION.

An ordinary general meeting of shareholders was held at the London Tavern, on Tuesday, to receive a statement of the affairs of the company from the liquidators, Messrs. Routh and Cobbett.

Mr. ROUTH in the chair.

The notice convening the meeting was read, as follows:—

Notice is hereby given, that an ordinary general meeting of the shareholders will be held at the London Tavern, Bishopsgate-street, in the City of London, on Tuesday, Feb. 11, 1868, at 1 o'clock, at which the liquidators will produce their accounts, showing the progress of the liquidation. And, further, notice is hereby given, that at the conclusion of the above ordinary general meeting, an extraordinary general meeting of the shareholders will be held, for the purpose of bringing before such meeting, and, if approved, of passing, the following extraordinary resolution, viz.:—That the proposition of the directors of the Mariquita Mining Company (Limited), as conveyed in a letter addressed to the liquidators of this company, and dated Jan. 16, 1868, whereby they offer to pay the sum of 7000*l.* in full discharge of the claim of this company against the Mariquita Mining Company (Limited), be accepted and confirmed."

Mr. VILLESBOISNET protested against the legality of the meeting.

The CHAIRMAN said they would be very happy to take Mr. Villesboisnet's protest at the proper time, but the present meeting, as indicated in the notice, was for the production of the accounts by the liquidators.

The CHAIRMAN said he would call upon Mr. Cobbett, his co-liquidator, to read the report of the liquidators.—Mr. COBBETT read the report, as follows:—

The liquidators report that, in accordance with the resolution sanctioned and approved at a meeting held for the purpose, on May 14, 1865, a contract was entered into by them with the directors of the Mariquita Mining Company (Limited) for the sale and transfer of the mines and property of the company for the sum of 71,544*l.*, to be paid as follows:—57,088*l.* in 114,176 shares of the nominal value of 1*l.* each, with 10*s.* per share credited as paid thereon, with the condition that 5*s.* per share be paid to the liquidators for the purposes of liquidation before allotment of the share by the member taking the same; and 14,456*l.* in cash, payable half in six months and half in nine months. The purchasing company to pay all debts and liabilities owing in New Granada at the date of the contract, and the liquidators agreeing to discharge all debts and liabilities in England. On May 30 the liquidators proceeded to offer to the shareholders the 114,176 shares, on the terms of the special resolution of May 14. The liquidators received applications of 83,640 shares out of the 114,176 shares, leaving 30,536 share still in the hands of the liquidators, to be dealt with in any way that may be deemed desirable. The new company having been unable to discharge the bills for 14,456*l.*, an arrangement has been entered into, which will be submitted for your approval, reducing the 14,000*l.* remaining unpaid to 7000*l.*, to be paid on certain conditions.

Mr. COBBETT then submitted the statement of affairs up to February, 1868, as follows:—

RECEIPTS.					
Balance at Messrs. Barclay's at commencement of liquidation				£ 447	5 5
Cash received—First instalment	£9988	2	6		
Second instalment	9499	17	6 =	19,488	0 0
(On issue of 83,640 shares in the Mariquita and New Granada Mining Company)					
Interest				1,442	15 2
Mariquita Mining Co. (Limited), on account of drafts, 14,456*l.* ..				456	0 0
Total				£21,834	0 7
PAYMENTS.					
Loans paid off				£13,550	0 0
Merchants' accounts for stores				2,065	15 4
Home pay				230	19 8
Sundry accounts, interest, &c.				5,330	10 7
Liquidation expenses				150	0 0
Balance at bankers				506	15 0
Total				£21,834	0 7
STATEMENT OF LIABILITIES AND ASSETS.					
LIABILITIES—Debentures	£20,000	0	0		
Unpaid claims	5,199	8	8 =	£25,199	8 8
ASSETS—Balance at the bankers	£ 506	15	0		
Amount owing on shares	1,422	0	0		
Mariquita purchase account	14,000	0	0 =	£15,238	15 0

A SHAREHOLDER asked if there was any claim on the part of the directors of the old company?—Mr. COBBETT said there was a claim, according to the original sum, as put down in the original statement. The liquidators would, of course, pay only legal claims.

Mr. ROUTH, in reply to a question, stated that when the liquidators met the shareholders upon the last occasion the liabilities of the company amounted to 43,000*l.*, whereas they were now reduced to 24,000*l.* The liquidation had so far gone on very satisfactorily, the liquidators having been able to do without a call upon the shareholders up to that time. He further stated that up to the present time the liquidation expenses had been only 150*l.*, as there had been every anxiety on the part of the liquidators, being large shareholders, to keep every expense as low as possible.

Mr. COBBETT said if the 30,000 unissued shares in the new company had been taken up by the shareholders in the old company, as was supposed would have been done, there would be no necessity now to propose any reduction of the amount agreed to be paid, for the directors in the new company would be able to pay the 14,000*l.*, and the liquidators close the accounts.

Upon the proposition of Mr. DE PASS, seconded by Mr. FITZGERALD, it was agreed (with but one dissentient) that the sum of 200*l.* per annum be paid to each of the liquidators.

An extraordinary general meeting was then held,

Mr. ROUTH in the chair.

The SOLICITOR read the notice.—Mr. VILLESBOISNET again made several ineffectual attempts to address the meeting, but the shareholders were unanimous in their dissent.—The SOLICITOR said that Mr. Villesboisnet had a perfect right to enter a protest if he chose, and, of course, it would be taken for what it was worth.

Mr. VILLESBOISNET then handed in a protest, which was to the effect that he protested against the liquidators taking power to make any such arrangement as that proposed.—The SOLICITOR said the question really was whether the liquidators would take 7000*l.*, or attempt to get 14,000*l.*, which the new company stated they were not in a position to pay.

Mr. COBBETT then read the letter addressed by the directors of the new company to the liquidators, to which the following reply was made:—

Jan. 16.—In reply to your letter to us, dated Oct. 19, relative to the payment of the overdue drafts for 14,456*l.*, accepted by this company, and handed to you in part payment of the purchase money agreed to be paid to you under the contract of May, 1866, we have now to submit to your consideration the following proposal, which we request you will lay before your proprietors:—The operations of this company since its commencement having resulted in a very heavy loss, it is the opinion of the directors that the amount of the purchase money agreed to be paid for the properties was in excess; they, therefore, think that some reduction of the balance of the purchase money remaining now unpaid should in justice be made. Since the formation of the company a loss of upwards of 23,000*l.* has been made by them, to recoup which they have been compelled to call up the whole of their uncalled capital, with the exception of 2*s.* 6*d.* per share. It is impossible to continue the working of the concern, and at the same time liquidate the amount owing to you; the company would, therefore, propose that, if possible, the following arrangement should be agreed upon:—That the sum of 7000*l.* be received by you in full discharge of the amount of 14,000*l.*, now owing to you; the same to be paid with interest at the rate of 5 per cent. per annum at the expiration of three months from the time of your acceptance of such arrangement. The company urge upon you the desirability of your agreeing to that arrangement, as they feel sure that it will be as much to the interest of your proprietors as it is to themselves.

Mr. COBBETT added that if the shareholders refused to agree to the poposition the result would be that the liquidators would have to press for the payment of the 14,000*l.*, and that would subject the new company to an immediate dissolution, and probably the property would be entirely lost. Under these circumstances, the liquidators had no hesitation in advising the shareholders to sanction and confirm the proposition. Of course, they were all anxious for the success of the new company, for it must be recollected that there were 30,000 shares remaining, and if they should at any time become of value in the market they would be an asset to return to the shareholders in the old company.

Mr. VILLESBOISNET again made an unsuccessful effort to address the meeting, but he was assailed with cries of "Pay your calls," "Turn him out," &c., when Mr. DE PASS expressed a hope that Mr. Villesboisnet should be heard.

The meeting, however, again unanimously declined to give him a hearing.

Mr. DE PASS, one of the directors of the Mariquita Mining Company (Limited), said that Mr. Villesboisnet was among the leading advocates for the re-constitution of the company, and was ever using his powerful eloquence in shadowing forth the enormous profits that would accrue to the shareholders in the new company. Mr. Villesboisnet had in the most pains-taking manner continued to direct his efforts towards the extrication of the old shareholders from their difficulties; but he (Mr. De Pass) was bound to acknowledge his utter ignorance of human nature, for after all the labour voluntarily undertaken by Mr. Villesboisnet in effecting an equitable distribution of the affairs, he found, to his amazement, that Mr. Villesboisnet had not taken a single share in the new company. (Oh! oh!) Now, to the question which was before the meeting—the shareholders were asked to forego the sum of 7000*l.* The liquidators in their report had set forth that the mines had been sold to the new company for an excessive sum, but that had been learnt only by experience. But the shareholders in the old company were to a tolerably safe extent out of an unlimited company, for the new company had liquidated the liabilities. From the beginning they had been working the mines at a loss, arising from two or three casualties—that is, from revolution, which appeared to be the chronic condition of New Granada; from the flooding of Santa Ana Mine by the breaking of the water-wheel, and from fire, and yet, singularly enough, the Mariquita Mining Company was alive, and it had hopes. (Hear, hear.) The Santa Ana Mine from February to September last year gave $48,875, but through various calamities it was at a cost of $88,658; the Marmato Mine during the same period cost $102,000, and yielded $113,000; and the Aguas Claras, a mine which scarcely came into the old company at all, the accounts that were being continually received as to its great richness were at all times most surprising. By simply sending the rough ore from this mine to England just as it was raised, it being rich enough to pay well to bring it from the interior of New Granada and ship it to this country, a profit was now being made. It produced 500 ozs. of silver per ton of ore, and three shipments had been made, which are estimated at $18,000. As to the present financial position of the new company, he might state that during the last two years there had been a loss of 22,000*l.*, and they had expended upon the Aguas Claras about 8000*l.* Supposing the meeting refused the proposition now before it, the new company would have to pay the old company whatever was due to them, and there remained a balance of assets in the hands of the new company of something like 6700*l.* of unpaid calls, in addition to which there was the last call of 10,000*l.* There was a balance at the bankers of (say) 489*l.*, and there was mineral to the value of 500*l.* There remained a total indebtedness on this side of 2700*l.*, against total assets, including arrears of call and uncalled capital, amounting to 16,000*l.*, subject to the debts in New Granada. He concluded by moving that the proposition of the directors of the Mariquita Mining Company (Limited), as conveyed in a letter addressed to the liquidators of this company, and dated Jan. 16, 1868, whereby they offer to pay the sum of 7000*l.* in full discharge of the claim of this company against the Mariquita Mining Company (Limited), be accepted and confirmed.—Mr. FITZGERALD seconded the proposition.

Mr. FATHARLY asked if it had been decided to limit the monthly expenditure at the Santa Ana Mine to $2000?—Mr. DE PASS said the best way to reply to that question would be to read a letter which had been received from their agent. It was as follows:—

Dec. 12.—Being about to undertake the superintendence of the Santa Ana establishment, and to carry into execution the plan proposed by the board of directors, which you, as the company's representative, have resolved to adopt, as the only means of saving the mine from abandonment. I have considered that it may be satisfactory to you to be informed, in writing, of the reasons upon which I found the confidence which I have expressed to you in the resources of the mine. In the first place, there about 160 square fathoms of lode between Lara's winze and the northern extremity of the present bottom stope, which, owing to the disadvantageous method of working, cannot be profitably extracted until the proposed works of development shall so far lay open the ground as to allow of its being mined by back stoping. Judging from the present and past yield of this run of lode, the value of this piece of ground is about $250,000, and supposing it to continue in depth, of which there can be little doubt, whilst this is being extracted the lode beneath will be in course of development for keeping up the supply of ore. It is, moreover, probable that the bunch will be found to extend southwards further than can at present be seen, and that the dead ground, which has interrupted the continuity of the lode through a considerable extent between the 50 and 100 fm. levels and the flookan and Illingworth's shaft, will be cut out and replaced by productive lode, as pointed out in the section of the Santa Ana Mine accompanying Mr. Gower's report. Then there is a lode to the east of and parallel to this, upon which limited workings have formerly been carried on and rich ore produced, which will be cross-cut into, and will, in all probability, open out a profitable source of supply. Again, there is the lode going down by Illingworth's shaft, and which has been neglected for many years; upon this workings will be opened between the 80 and 100 fathom levels, with every probability of furnishing a large supply of good ores from it. Besides these known sources of mineral, there is the entire lode standing unexplored, both to the north and south of the present workings, save only at the shallow adit, which once furnished good ores, and this circumstance indicates the existence of ore deeper, at points accessible by levels from the deep workings of the mine on the course or the lode, upon which levels of exploration should be extended both north and south, for upon the discovery of sources of ore in these directions depends, in a great measure, the question of the duration of the mine, as the increasing difficulties and cost of working in depth, unless the lode becomes much richer than there is reason to expect, must sooner or later limit the working in this direction. The probability of cutting into good ore ground by the cross-cut in the 70 to the San Juan lodes I have not taken into consideration in my calculations. This is, no doubt, an important and interesting work, and if successful will place the establishment in a profitable and permanent position. I beg to assure you that should any circumstance arise which may tend to weaken the confidence I now entertain of the successful issue of the enterprise you have confided to me I will immediately inform you thereof.—R. J. TREFFRY.

The motion was put and carried, with but one dissentient. A vote of thanks to the Chairman and directors terminated the proceedings.

ENGLISH AND AUSTRALIAN COPPER COMPANY.

An ordinary general meeting will be held on Thursday.

The report to be submitted states that the gross quantity of ore delivered to the works by the South Australian Mining Association, from July 1, 1866, to June 30, 1867, was 5616 tons, against 6936 tons during the previous year; 3434 tons of ore, regulus, and rough copper were received from other sources, against 3310 tons; 2808 tons of ore were smelted at the Burra Smelting-Works, against 3446 tons, and 6227 tons of ore and regulus, against 6837 at the Port Adelaide Works: 759 tons of rough copper, against 762, were made at the Burra; 2173 tons of copper, against 2233, were made at the Adelaide Smelting-Works; and the total quantity made at those works was 2173 tons, against 2342 tons. During the year ending June 30, 1495 tons of copper were shipped from South Australia, against 1409 tons the previous year. The ore received from the Burra Burra Mine during the year ending June was 5616 tons, against 6936. Since the suspension of the active working at the mine on March 28, the quantity of merchantable ore obtained during the six months ending Sept. 30, 1867, has been nearly 1300 tons, estimated to yield an average of 16 per cent. of copper. The water has been carefully kept out of the principal workings, and sinking the new engine-shaft continued. It is hoped that the time is not far distant when active working will be resumed. As to the railway to Port Wakefield, which is entirely a Government concern, the cutting of an approach to the sea-side was progressing, and the extension to the Burra was about to be commenced at the date of the last advices from Adelaide. The Bill for the railway from Port Augusta northward had passed both Houses, and a scheme for carrying it out would shortly be submitted to the public. All these undertakings are fraught with interest to this company, and the directors hope for advantageous results in the increased facilities of communication between their works at Kooringa and Port Adelaide, and in the development and impulse they must necessarily give to all the copper ore producing districts of South Australia. The accounts for the year ending June 30, 1867, show a profit of 8792*l.* 5*s.* 6*d.* on the twelve months' operations, after carrying 510*l.* 14*s.* 7*d.* to the credit of the reserve fund, for interest thereon. From this has to be deducted 1589*l.* for over valuation of copper on June 30, 1866, and 175*l.* 9*s.* 5*d.* taken from the February dividend in excess of nett profit on that date, leaving 7026*l.* 19*s.* 1*d.* available for dividend. A dividend of 1*s.* per

share (3500*l.*) was declared in August, and the directors recommend to the shareholders a further dividend of 1s. per share, free of income tax.

The directors think they may fairly congratulate the shareholders on the results of the year's operations, which have only been secured by the strictest attention to economy in every department. The reserve fund now amounts, after adding interest to Dec. 31, to the sum of 11,669*l.* 7s. 6d.

MINING IN EASTERN NEVADA, U.S.

[*From our Correspondent.*]

At Belmont (Philadelphia mining district) work is prosecuted with unabated vigour. The Belmont Company's works, upon the Transylvania Ledge, have developed a splendid body of ore from the bottom of the incline north, as far as the gallery extends. This is at the water line, and has been driven for a distance of about 50 feet. The body of ore throughout this extent is found to be 15 feet thick, and now supplies the 10-stamp mill of the company. It requires but little assorting. A winze is in progress for connecting the first and second levels. The ore in the first level continues to be of an excellent quality, the pay streak being from 6 to 9 ft. thick. Recent developments on the Belmont Company's claim of the El Dorado have confirmed the opinion of the best judges that this is one of the most prominent ledges of the district. The new 40-stamp mill of the Combination Company, situated at East Belmont, is rapidly approaching completion, and will, probably, be in motion on or before Feb. 15. It has ten roasting furnaces now ready for the pulp, 32 amalgamating pans, and 16 large settlers already in place, the battery completed, and the engines and machinery nearly ready to run. Several hundred tons of ore have already been delivered at the battery, and is now arriving there at the rate of about 40 tons daily. An immense quantity of wood is corded up in the mill-yard, and everything connected with the works betokens success. James M. Gawley, formerly connected with some of the principal mills in the vicinity of Austin, where he earned the reputation of being one of the most successful amalgamators in the State, has been engaged to undertake the charge of the amalgamating department. The mill of the Combination Company certainly starts under the most favourable auspices, and the large amount of bullion it must necessarily produce will awaken a great interest in this section of the State. Some time since nearly 4 tons of ore, from the Silver Champion Mine, at Belmont, were taken to Austin for reduction, which, upon working, yielded at the rate of $302 per ton. This ledge is the property of J. R. Murphy and Robert Morrill, and is situated nearly two miles north-west of the town of Belmont. The ledge is 3 ft. thick, and two men at present working upon it take out about 4 tons per week. This is $604 gross to the hand for a week's labour. With a mill upon the ground, the total expense of mining and milling the ore could not exceed $50 per ton; this would leave a nett profit of $504 to the hand per week. This shows what could be done with increased labour if there were a costum mill in the district, as at present all ores, save those worked by the Belmont Company, are hauled to Austin, 2[illegible] miles, for reduction: 14 tons of ore from the El Dorado, south, owned by W. . Leon and Co., were lately taken to Austin and worked. It was the intention to obtain as fair a test of the entire pay streak as possible, and the ore as it came from the vein was reduced, returning upwards of $200 per ton. J. C. Bateman has also a few tons from the Silver Circle reduced, yielding near $200 per ton.

In the Hot Creek district, upon a location known as the Norfolk, adjoining the Merrimac on the south, about 150 yards from Hot Creek Cannon, an incline has been commenced, and a body of rich ore found. It occurs in a sort of conglomerate, and was at first thrown away as worthless, but an experienced eye having detected chlorides, and now and then a blotch of the black mineral, peculiar to the "Indian Jim," in the dirty-looking mass, assays from it were had, and it was found to contain from $400 to $700 of silver per ton. It is owned by the Old Dominion Company. Work upon the Merrimac still continues without interruption. A tunnel is now in progress from the shaft to the eastern wall of the ledge, in which occasional bodies of fine ore are encountered. On the Old Dominion Mine work continues upon both an incline and a tunnel. The latter will tap the vein at a depth 200 feet from the surface. Shiller and Co. are running the little 10-stamp mill erected by Gould, working about 5 tons of ore daily, with excellent results. The Old Dominion Company's mill is still running to its full capacity. Gillette and Clark have struck a large and favourable looking ledge on the foothills near the mouth of Rattlesnake Cannon; it is about 8 ft. wide, and shows a large amount of milling ore, but not of a very high grade. It is expected that upon the opening of spring unusual activity will prevail in Hot Creek district, as much capital has already been invested there, and the developments made have resulted favourably. The crude bullion from this district is assayed and refined at Belmont; it runs very fine—a lot lately brought in by Judge L. W. Ferris, from his little 5-stamp mill, went 985 fine.

In the Silver Peak district the mill of the Great Salt Basin Company is progressing as rapidly as circumstances will permit, 40 men being employed upon it. The capacity of the mill will be 40 stamps, 20 of which, with concomitant machinery, will be in motion early in the spring. The company has about 25,000 tons of ore ready for milling. A road from a tramway has recently been surveyed from the Crowning Glory Mine, at Red Mountain, to the mill in the valley, a distance of about seven miles; considerable grading has been done, and about 50 men are engaged upon the road cutting ties, and preparing to lay the iron track. Everything connected with the affairs of this company is done in a thoroughly systematic manner, under the direction of Mr. J. E. Clayton, a competent engineer.

FOREIGN MINING AND METALLURGY.

The quantity of coal imported into France from the Prussian collieries of the Sarre in 1866 was 195,140 tons. This result was greatly surpassed in 1867, when the total imports of Prussian coal into France amounted to 500,000 tons, notwithstanding nearly three months' suspension of operations occasioned by frosts, &c. The demand for iron in the Haute Marne is still stated to be comparatively small. Coke-made iron is held at 7*l.* 4s., and mixed iron at 8*l.* 4s. to 8*l.* 8s. per ton. Machine iron, No. 20, only brings small orders, at 8*l.* 8s. to 8*l.* 16s. per ton. The foundries of the group, in common with the forges, have been obliged, it is stated, to slacken their production. A foundry of the Meuse has just obtained an order for turn-tables for the Paris, Lyons, and Mediterranean Railway. A contract for iron bridges on a line from St. Dizier to Vassy has been partially obtained by an Ivry maker; the remainder of the contract has been secured by the Bussy Foundry, near Joinville. The proprietors of the last-mentioned works, MM. Capitain and Sailn, have also obtained contracts for girders and other ironwork for lines from Niederbronn to Thionville and from Belfort to Guebwiller. Small contracts have been secured of late in the Moselle and the Meurthe, but they are not sufficiently numerous or important to absorb the current production, and there appears a probability that a heavy stock will accumulate,—a circumstance which will not improve the situation. The extreme cheapness of the products of these departments would seem to exclude all foreign products from them; nevertheless, we continue to see Creusot forwarding refining pig up to the extreme frontiers, although it is a question whether that great establishment can realise a profit, by doing so from the onerous terms on which transports are effected for so considerable a distance. The Pont-a-Mousson furnaces are delivering good pig for re-casting purposes at 3*l.* 10s. to 3*l.* 12s. per ton; this, however, does not prevent the second fusion pig of Montluçon from penetrating as far as Ars-sur-Moselle. Some small orders have been received in the forges of the departments of the Meurthe and the Moselle, but nothing has occurred to indicate a decided revival of activity. It is now announced that the Decazeville works in the Aveyron have been purchased by the Cérigny Company and the old obligation holders, at 123,200*l.* Meetings are announced as follows:—Maurienne Mines and Blast Furnaces Company, Feb. 15, at Paris; Denain and Anzin Blast Furnaces and Forges Company, Feb. 28, at Paris; Sougland and Fourmies Forges and Foundries Company, Feb. 29, at Paris; Bank of Mines, Feb. 29, at Paris; and Metallic Mines of the Haute-Loire Company, Feb. 29, at Yssengeaux.

The Belgian Minister of Public Works has announced that an adjudication, named for the 20th inst., of a contract for Bessemer steel tyres for the wheels of locomotives, tenders, and carriages for the Belgian State Railway is adjourned. There is nothing particular to note in other respects with regard to Belgian metallurgy. Both at Liége and in the Hainaut it is affirmed that industrials will be under the imperious necessity of reducing their production, and making a considerable abatement in wages. On the other hand, some more sanguine minds discern symptoms of a revival of industry in the general state of affairs. A meeting of forgemasters of the Charlerol basin has been held, at which complaints were made as to a new tariff introduced on the Belgian State Railways, and applied as from Feb. 1, 1868. Other interests have, of course, to be considered in connection with this important question. The question of iron sleepers was also discussed at the forgemasters' meeting, and astonishment was expressed that the administration of the Belgian State Railways should not have admitted this improvement, while the Great Central Belgian Company and other undertakings have decided to use such sleepers, considering that they are an improvement upon wooden ones, both from a technical and economical point of view. Meetings are announced as follows:—Haine St. Pierre Forges, Ironworks, and Foundries Company, Feb. 15, at Brussels; Bois Colliery Company, Feb. 25, at Quaregnon; United Collieries Company, Feb. 28, at Quaregnon; and Bonne Fin Collieries Company, March 2, at Liége.

A strike and serious disturbances have taken place in the Marcinelle and Gilly coal mines, near Charlerol. Several arrests have taken place.

It is important to note in connection with the question of foreign railway construction, that the Prussian railway loan (guaranteed by the Government) has been subscribed nearly twice over. The Hungarian railway loan has also been covered. The success of these loans must give a powerful impetus to the demand for rails and plant in Prussia and Hungary. The Cruvino Mines Company has just held a general meeting of its shareholders. The company has a capital of 29,000*l.*, and was formed in June, 1863, for the working of a mine of nickel, conceded in July, 1861, by a decree of His Majesty, King Victor Emmanuel. The report presented to the shareholders detailed the course of the company's affairs in 1866-7; it was full of hope as regards the future, but was somewhat barren as regards present results. The company seems, however, to have rather more than paid its way in 1867, and for 1868 the directors anticipate a profit of 4000*l.* In order to arrive at this result, the management has resolved not to present the nickel on the markets in a rough state, as its value is then, it considers, considerably depreciated; it has accordingly established a blast furnace, so as to offer it for sale in mattes. The direction has further concluded a contract with an industrial establishment, so as to facilitate still further the disposal of the products made available for consumption by the company. The meeting approved the various steps taken by the administration.

Copper has been firmly sustained on the Havre market, and it is thought by some that affairs will acquire a greater activity; several important lots of disposable Chilian have been run off at 70*l.* 4s. to 70*l.* 10s. per ton; for deliveries to be made at the close of March 71*l.* per ton is asked. The Paris copper market has been somewhat firmer; Chilian remains sustained at 70*l.* 10s. to 71*l.*, and Corocoro mineral at 73*l.* English copper has been in no great demand. In consequence of the sustained improvement of the English market, the German markets also show a tendency to greater firmness. At Berlin transactions have been rather animated, at Stettin, English and Swedish have found easy outlets, and at Hamburg the article has been somewhat more sought after, and has been held at an advance. Affairs in tin have presented no great amount of activity on the Dutch markets, upon which a certain feebleness appears to prevail; it is thought, however, that the depression is only temporary. At Rotterdam a lot of 600 ingots of Banca have changed hands at 52 fls., and 10,000 ingots at 51¾ fls., whilst a lot of 500 ingots, to be obtained from the approaching public sale, has found purchasers at 52¾ fls. A lot of 900 ingots of Billiton has also been ceded at 51 fls. At Amsterdam some sales have been effected at 51¾ fls. Annexed are particulars as to the deliveries and stock of tin on the Dutch market Jan. 31:—Deliveries from Jan. 1 to Jan. 31—1868, 6650 ingots; 1867, 10,950 ingots; 1866, 11,950 ingots. Stock on schedules, Jan. 31—1868, 144,459 ingots; 1867, 120,159 ingots; 1866, 84,909 ingots. Unsold stock of the Society of Commerce, Jan. 31—1868, 43,779 ingots; 1867, 72,662 ingots; 1866, 125,933 ingots. The German tin markets have generally continued quiet, and prices have in many cases given way. The Paris tin market has displayed little change, Banca making 93*l.*, Straits 91*l.*, and English 91*l.* 4s. per ton. At Marseilles prices have been to some extent nominal. Lead has been a little firmer on the German markets, but no affairs of material importance have been recorded. There is no change to note in the position of the article at Paris, where rough French is quoted at 19*l.* 8s.. Belgian and German making about the same terms. At Marseilles the market has been quiet, and prices have been to some extent nominal, lead in saumons, first fusion, making 18*l.* 6s.; ditto shot, 19*l.* 16s.; and rolled and in pipes, 21*l.* per ton. The Paris zinc market has been quiet, rough Silesian making 20*l.* 18s., and zinc from other sources 20*l.* 4s. per ton. At Hamburg there has been a comparative absence of transactions, but holders have, nevertheless, maintained former rates. Breslau advices present little interest; the proprietors of the works of the district entertain, however, good hopes as to the future of the article, and await a good current of affairs on the re-opening of the navigations, stocks abroad being generally limited.

MINING IN AUSTRALASIA—MONTHLY SUMMARY.

VICTORIA.—A nugget weighing about 130 ozs. was recently sold at Maryborough. The owners withheld all particulars. In Castlemaine district the finding of a 77-oz. nugget, almost pure gold, has been recorded.

NEW SOUTH WALES.—A nugget weighing nearly 58 ozs. was found last week at King's Plains, on the surface; it is reported that another, weighing 11 ozs., has been discovered in the same locality.

MINING ON THE PENINSULA.—The quantity of copper exported during November was 836¼ tons, which, at 80*l.* per ton, gives a value of 66,900*l.* We believe nearly 1200 tons of ore were also shipped, and this must have been worth about 12,000*l.*

YELTA.—We understand Mr. George Green, who proceeds to England by the next mail steamer, is empowered to make arrangements for forming an English company on very liberal terms; and which, no doubt, from his well-known business abilities, he will have little trouble in doing. The mine is looking well in the 50, but the water has increased very much, and it is necessary to erect machinery to keep it under. Some thousands of tons of ore is in sight at the various levels, but it requires a crushing-mill and machinery to dress it to a marketable value. Hand labour is too expensive.

PARRAMATTA.—There were 145 tons of 20 per cent. ore sent away from this mine last week, and shipped by the Omagh, for the Port Adelaide Smelting Works. A very considerable quantity of ore is again on the floors, and it is anticipated that another 80 tons will be ready for shipment by the end of this month.

PARRAMATTA, AND WHEAL HUGHES.—We have seen some very rich samples of black sulphide of copper from the Parramatta Mine. Similar ore has also been found in Wheal Hughes, together with rich purple sulphide. Both of these mines are highly promising. Good ore is being got below the slide in the Parramatta.—*Wallaroo Times.*

AUSTRALIAN MINES.

YUDANAMUTANA COPPER.—The superintendent (Dec. 28) states—Since my last advice we have sold here 58 tons of rough copper, realising the sum of 4043*l.* 5s. 2d. nett. And, in addition to the sum of 4563*l.* previously advised as having been paid on account of the 7000*l.* loan, we have made a further payment of 3949*l.* 3s., being the total amount of the balance and interest due thereon.—Capt. Terrell's report (Dec. 14) states—"We have raised 384 tons of ore during the month. The above return confirms the richness of the mine; it is indeed a splendid property. I have now sufficient ore in sight to last many months. The smelting-works are in good working order. The quantity of copper made during the month is 56 tons. Plenty of wood is coming in; we have a good stock on hand." The Port Augusta Railway Bill has passed both Houses and received the Governor's assent on Dec. 19.

GREAT NORTHERN COPPER.—Captain Tonkin (Dec. 21) reports—We have the same soft strata of ground in the cross-cut south of deep adit as when last reported, and expect shortly to meet with a good paying lode. The ground is very congenial for copper. There is no doubt but that we are working in the right direction to get the ore. The winze west of long cross-cut promises to yield ore in paying quantities.

WORTHING.—Dec. 18: Legg's engine shaftmen have finished cutting the plat in the 83, and commenced driving the cross-cut west to cut the main lode, which I hope will be met with in a few days, as the ground is easier for driving. Ground driven in the past month 23 ft. 6 in., present price 12*l.* per fathom. It has been considered advisable to cease spending money in the 63 fm. level end, as, though more water was issuing from the end, it had no effect in the 53, thus showing no indication of its assisting in unwatering that level; the ground was hard, and progress slow. Looking at the whole circumstances of our position, it was considered better to put the men to stope south in the 63 back, if it could be done with safety, it being under Harding's stope; the object being to persevere in this way until some better clue is met with to show the effects of the numerous slides before mentioned. During the past month some fairer ground was met with in the face of the stope in the 73 fm. level end south. Capt. Frisk at once put the men to drive in it. At about 2 fathoms the men again came to hard ground, with softer branches running into the hard; we hope by this means to make better progress after stoping the hard ground underhand up to the present end. Adopting these two changes will, we expect, give us better returns of ore. The cross-cut in the 83 was driven 4 fathoms, and the ground still favourable; price 12*l.* per fathom. You will remember both the cross-cuts in the 63 and 73 were very tedious and expensive. So far the prospects in the 83 are more favourable; also there was a little ore and decomposed white iron showing in the end. This is also favourable, as in the upper cross-cuts we had no indication of lode whatever until it was actually cut. In the 73 cross-cut west we have driven up to, and cut through the slide that passed through the lode just below the 53. The stopes at work are much as usual. Quantity of ore raised during the month 180 tons; number of hands employed 116,

PORT PHILLIP AND COLONIAL.—The quantity of quartz crushed during the four weeks of November was 4782 tons, yielding 2400 ozs. of gold, or an average of 10 dwts. 1 gr. per ton. The receipts for the same period were 8793*l.* 7s. 3d. Expenditure (including 1000*l.* on firewood), 5134*l.* 17s. 6d.; profit, 3658*l.* 9s. 9d.; added to which was balance of last month—1156*l.* 6s. 3d., which left an available balance of 4814*l.* 16s. The amount divided between the two companies was 2000*l.*, the Port Phillip Company's proportion of which amounted to 1300*l.*, the balance of 2814*l.* 16s. being carried forward to meet contracts for firewood and mine timber. The above return shows an improvement in the yield of quartz to the extent of 18 grs. per ton. The gold from pyrites added 13½ grs., bringing it up to 10 dwts. 1 gr. per ton.—Mine: All the underground work is going on very well. The stopes continue to look well throughout, the southern portion of Robinson's vein being especially favourable for yield, and the shallower works in exploration of this lode in sections 11 and 12 continue to open up fresh productive ground. About the 150 feet level a good branch seems to be making itself separate from the part of the lode formerly worked upon, rising towards the east with a greater inclination than the other portion, which promises to furnish some favourable support to the returns.—Machinery: This is all working very well, and the stamps doing good duty.—Return for the first weeks of December: Quantity of quartz crushed, 3740 tons, yielding 1859 oz. 5 dwt. of gold, or an average of 9 dwt. 22½ gr. per ton. Remittance 1250*l.*

ENGLISH AND AUSTRALIAN COPPER.—The returns of furnaces at work at Kooringa and Port Adelaide, and of stocks of coal, have not come forward by this mail. Since the date of the last advices shipments of 125 tons of copper had been made, and a further 100 tons were in course of shipment at the date of advice.

SCOTTISH AUSTRALIAN.—The directors have advices from Sydney, dated Dec. 24, with reports from Lambton Colliery to the 22d. The sales of coal for November amounted to 15,823 tons. The quality of the coal continued very good, and there was a satisfactory and apparently increasing demand for it.

CADIANGULLONG CONSOLIDATED COPPER.—The directors have advices from Sydney, dated Dec. 24, with reports from the copper mines and smelting works to the 21st.—Copper Mine: During the month there were sampled from the mine 63½ tons of ore, averaging about 13 per cent. for copper, and yielding by assay 8½ tons of fine copper.—Smelting Works: There have been shipped to London, per Jason, 13¾ tons of fine copper; there were 8 tons more at the works ready to be dispatched to Sydney, and a considerable quantity more in a forward state. Operations, both at the copper mines and smelting-works, were gradually being contracted.

FORTUNE COPPER (W.A.)—Capt. Penberthy (Oct. 29) reports—We have forwarded to port this month 107 tons of lead ore and 27 tons of copper ore: total, 130 tons, of the usual percentage. In store, awaiting shipment, on Oct. 31, 626 tons lead ore, and 110 tons copper ore. Mr. Samson advises, under date of Dec. 27, having shipped, per Bridgetown, 55 tons lead ore; also, per Fitzroy, 27 tons copper ore, and 234 tons lead ore.

FOREIGN MINES.

VAL ANTIGORIA.—Capt. Thos. Roberts, Crodo, Feb. 1: Amalgam on hand, 4747 grammes. Gold remittance will be made by the end of this month. The walls of the new crusher-house are under construction, and as far as the weather permits our surface work, connected with the new machinery, is being urged. The lode in the adit north yields 10 dwts. of gold per ton of ore. The lode in No. 1 winze, sinking below the 20, yields 14 dwts. of gold per ton of ore. The lode in the 30 fm. level end south is worth 16 dwts. of gold per ton. The winze on No. 2 lode, under the 10, is very regular; the ore worth 12 dwts. of gold per ton.

ALAMILLOS.—Feb. 1: The driving of the 3d level, east of La Magdalena shaft, is resumed, and the lode is of a very promising appearance, producing 1 ton of ore per fm. The third level, east of San Enrique shaft, is poor at present, the lode being disarranged. The 4th level, east of La Magdalena shaft, produces 1 ton of ore per fm.; the lode here has declined in value, and become very hard for driving. The lode in the 4th level, west of Magdalena shaft, yields 1 ton of ore per fm.; this lode has undergone a great change, being divided, and much reduced in value. There has been no improvement in the 4th level, east of Taylor's shaft, during the past month. The 4th level, west of San Andriano shaft, yields ½ ton of ore per fm.; the lode is becoming vughy and more open than it was, and we expect an improvement. The 3d level, west of San Yago, produces ½ ton of ore per fm.; this lode opened good ore ground in the past month, it then became poor, but is again improving. The lode in the 3d level, east of Crosby's engine-shaft, is split into branches, and unproductive. The 2d level, west of Crosby's cross-cut, yields 1½ ton per fm.; this is laying open a good length of fairly productive tribute ground.—Shafts and Winzes: Taylor's engine-shaft, below the 4th level, yields 1 ton of ore per fm.; in a few days this shaft will reach the necessary depth for a fifth level, when driving east and west will be commenced; the lode is large, consisting of calcareous spar, spotted with lead. Berdie's winze, sinking below the 3d level, produces 1¼ ton per fm.; this winze is going down in a strong, kindly, and productive lode. The lode in Fernandez's winze produces 1 ton per fm.; this is not so promising as it has been. The tribute department yielded very well in the past month, and has not undergone any noticeable change. The surface work is going on very regularly, and the machinery is in very good working condition. We estimate the raisings for February at 250 tons.

FORTUNA.—Canada Incosa Mine: Feb. 1: In the 100, west of O'Shea's shaft, the ground continues very hard. The lode in the 90, west of Judd's shaft, has fallen off in value during the past few days, and is getting harder for driving; it is now worth 1 ton of ore per fathom. In the 80, west of Judd's shaft, the lode is very small, yielding ½ ton of ore per fathom. The 70, east of Carro's shaft, produces 1 ton of ore per fathom; this has passed through a strong cross-course, and we expect a good run of ore ground in advance of this end. The 55, east of Carro's shaft, will be holed to the same level, driven west from St. Tomas 'shaft, in the present month.—South Lode: An improvement has taken place in the 40, west of San Pedro shaft, the lode now producing 1 ton of ore per fathom. The lode in the 50, east of Gil's winze, produces occasionally stones of ore, but scarcely sufficient to attach a value to. A slight improvement has taken place in Gomez' winze, sinking below the 30, the lode being large, and worth ½ ton of ore per fathom.—Los Salidos Mine: The 100, west of Morris's engine-shaft, has passed through the elvan course into granite, and will soon reach the lode. The ground in the 90, west of Morris's engine-shaft, is hard for driving, and the lode is unproductive. The 75, west of Buenos Amigos shaft, yields 2½ tons per fathom; this end will remain idle until the stuff can be drawn through Buenos Amigos shaft. The lode in the 65, west of San Carlos shaft, is small, producing ½ ton per fathom; the ground is hard. In the 100, east of Morris's engine-shaft, we are opening the north side of the level, and hope to intersect the main part of the lode shortly. The 90, east of Cox's shaft, produces 3 tons of ore per fathom: the lode has improved in this end, being wide and strong, and is opening a valuable run of ground. The 75, east of Cox's shaft, yields 2½ tons per fathom; this lode has greatly improved, and consists of carbonate of lime, quartz, and lead. The lode in the 65, east of San Miguel, is unproductive, and the ground hard.—Shafts and Winzes: San Pablo's shaft, sinking below the 65, produces 2½ tons of ore per fathom; this has reached the 75, and will be holed to the end driving east of Cox's shaft in a few days. The lode in Buenos Amigos shaft yields 1½ ton per fathom; the men are making excellent progress in sinking this large engine-shaft. The lode in Carrascosa winze, below the 75, is a small, compact, and productive lode, yielding 13¾ ton per fathom. The stopes, on the whole, have not undergone any unusual alteration in the past month. The surface works are going on very regularly. The machinery is in right good working order. We estimate the returns for February month (five weeks) at 500 tons.

LINARES.—Feb. 1: West of Engine-Shaft: The 110 fm. level, west of engine-shaft, produces ½ ton of lead ore per fm.; the lode is very small in the end and lets out a good quantity of water. The lode in the 75, west of Warne's shaft, is large and open, letting out a powerful stream of water, and producing 1 ton of ore per fm. In the 75, east of Crosby's shaft, the lode which is not so good as it was, yields 1 ton of ore per fm. The 31, east of San Francisco shaft, produces 1 ton of ore per fm.; the lode in this end has been declining in value for some past.—East of Engine-Shaft: The 95, east of Taylor's cross-cut, yields 1 ton per fm.; the lode is very wide, and spotted throughout with lead. The lode in the 95, east of Taylor's shaft, produces ¼ ton of ore per fm.; it is large and open, and easy for driving, consisting of calcareous spar and stones of ore. The lode in the 95, east of No. 154 winze, is large and strong, producing 1 ton of ore per fm.—Shafts and Winzes: In Warne's engine-shaft, sinking below the 75 fm. level, the lode produces 1½ ton per fm. We are glad to be able to report progress in this work; the water is now kept out with the most perfect regularity, and the shaftmen are working very industriously, without any kind of let or hindrance, and we expect that a good measurement will be made by them in the present month. No. 155 winze, below the 61, yields ½ ton of ore per fm.; the lode has failed in this winze. No. 156 winze, below the 61, produces 2 tons of ore per fm. This is going down in a very good lode, and the men are making satisfactory progress. The stopes in the different sections of the mines—viz., Pozo Ancho, Warne's, and San Francisco—have yielded a fair average quantity of ore in the past month, and are likely to produce at the same rate during the present month. The machinery is in good working order, and the surface operations generally are going on regularly. We estimate the returns for February (five weeks) at 300 tons.—Quinientos Mine: Taylor's engine-shaft, sinking below the 20 fm. level, produces 1½ ton per fm. There is a very fine lode in the western end of the shaft, but in the middle of the shaft it is intersected and thrown north by a cross-course, leaving the lode small and poor on its eastern side.

JOINT-STOCK COMPANIES.—The prospect of a revival in commercial affairs will naturally create a desire amongst the many who have mineral and other properties to offer to the public as investments to possess as intimate an acquaintance as possible with the laws by which public companies are governed; attention may, therefore, be directed to the new edition of the admirable little handbook—"JOINT-STOCK COMPANIES: HOW TO FORM THEM"—by Mr. Thomas Tapping, barrister-at-law, which has just been issued for half-a-crown. The author's object has been to furnish not only an epitome of the law as it stands, but also to express it in popular and intelligible language; in this he has thoroughly succeeded, and as the whole of the information has been arranged in the form best calculated to meet the wants of the non-professional reader, it can scarcely fail to be favourably received. The book is published at the *Mining Journal* office, and will be forwarded, on receipt of the amount to those requiring it.

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